Questions and Answers for Dental Students,

... BY ...

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PART THIRD.—SENIOR COURSE.

ERRATA—PART III.

PAGE 15.—The Answer to 1st Question is to be found at top of Page 16.

PAGE 16.—In last line of Page read *warty* instead of wary.

PAGE 18.—In last line but one of Answer to 6th Question from top, read *antra* instead of autra.

PAGE 27.—The Questions and Answers relating to *Ranula* and *Sublingual Cysts* on this Page, should appear at end of Oral Surgery on Page 19.

PAGE 30.—In 9th Question from top omit the *a*.

PAGE 32.—In Answer to 2nd Question under Metallurgy, read 66 instead of 60.

PAGE 37.—In last line of Answer to 1st Question from top, read *filings* instead of fillings.

PAGE 57.—In 4th Question from top, read *false* instead of balse.

PAGE 58.—In 1st Answer from top read 773° instead of 770°.

PAGE 73.—In 3d line of Answer to 5th Question from top, read *palatine* instead of palative.

PAGE 74.—In Answer to 2nd Question from top, read *amalgam* instead of almagam.

A SERIES

OF

Questions and Answers

FOR

DENTAL STUDENTS,

CONSISTING OF THREE PARTS:

PART I.—Pertaining to the Freshman Course.
PART II.—Pertaining to the Junior Course.
PART III.—Pertaining to the Senior Course.

PART III.

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Contents of Part III.

SENIOR COURSE.

DENTAL PATHOLOGY.

DISEASES OF DENTAL PULP.

Q. In the treatment of pathological conditions of dental pulp, what is it necessary to understand.

A. Its structure, functions, susceptibilities, life endowments, resisting and recuperative power, and its pathological conditions.

Q. Into what two portions is the pulp divided.

A. Coronal, and root portion.

Q. What are the horns of the pulp.

A. The projections under the cusps of crowns.

Q. To what group does the tissue of pulp belong.

A. Connective tissue group.

Q. What portion of pulp do the odontoblasts form.

A. The periphery.

Q. What is the arrangement of blood vessels of pulp.

A. The two or three trunks which enter the apical foramen, divide into a number of branches, until the entire tissue is permeated by a rich plexus or net-work of capillaries immediately beneath membrana eboris.

Q. How are the veins distributed.

A. They are somewhat larger than the arteries and anastomose freely with each other.

Q. How are the nerves of pulp arranged.

A. Enter foramen with arteries, and form a bundle throughout the root portion of pulp; but in coronal portion they sub-divide in every direction, and send filaments to periphery; immediately beneath membrana eboris a very delicate nerve plexus exists.

Q. Are any lymphatics found in pulp.

A. No.

Q. Name pathological conditions of dental pulp.

A. Simple exposure; irritation, which includes hyperæmia; inflammation—pulpitis—either acute or chronic; suppuration; gangrene; fungous growth, or polypus; calcification of its tissues, including nodular deposits, and secondary dentine.

Q. How are all exposed dentinal surfaces connected with the pulp.

A. Through the fibrillæ.

Q. May irritation of pulp occur without its exposure.

A. Yes, from pathological conditions of fibrillæ.

Q. Name causes of irritation of pulp.

A. Exposure of dentine to thermal changes, to extraneous agents, mechanical violence; from constitutional causes, such as malaria, rheumatism, gout, dyspepsia, syphilis, etc.

Q. How may a metallic filling near pulp cause irritation.

A. By conducting property of metal.

Q. Is pulp ever affected by impressions through enamel.

A. No, not permanently.

Q. When dentine is exposed by caries, what results.

A. Fibrillæ kept in constant state of irritation, which may extend to pulp and, if continuous, cause pulpitis.

Q. Does extent and rapidity of irritation of pulp depend upon density of tooth.

A. Yes, in caries in teeth of soft structures, chemical action exposes a greater area of organic matter to irritating effects of acids, and micro-organisms, and there is a more rapid disintegration of structure.

Q. Why is the irritation of fibrillæ in very dense teeth not so prone to extend to pulp.

A. Because tubuli have small calibre, and the slow progress of caries in such teeth.

Q. Is young and also imperfectly developed dentine more liable to such impressions

A. Yes.

Q. How may impressions of heat and cold, if long continued, reach dentine, independent of caries.

A. By fluids or currents of air penetrating fissures in enamel, or affecting an abraded surface.

Q. What is direct and most positive cause of irritation of pulp.

A. The action of caries.

Q. The formation of what structure affords a good example of effect of gradual but continuous irritation of pulp.

A. That of secondary or osteo-dentine.

Q. What affection of teeth.

A. Hypercementosis.

Q. What is effect of long continued friction on a surface of dentine.

A. Tubular consolidation—deposit of secondary dentine in the tubes.

Q. Is it often unwise to fill teeth of young patients with metal without interposition of some non-conducting material.

A. Yes, for in exact ratio to sensitiveness of tissue will be the danger of thermal action.

Q. Does long continued over-stimulation of a thin layer of dentine ever cause death of pulp.

A Yes, and action of obtunders should be restricted to a superficial layer of dentine.

Q. What do many consider to be best fillings for children between twelve and fifteen years to lessen danger of thermal action.

A. Non-conducting materials.

Q. How demonstrate that pulp manifests decided sensibility to thermal changes.

A. By throwing on a normal tooth a jet of ice water and one of warm water when patient experiences a sharp twinge of pain from each jet.

Q. If rubber dam is so applied that all parts of crown are protected what will be result.

A. No sensation of heat or cold, but one of pain.

Q. What furnishes a good example.

A. Excavating a superficial cavity with bur on engine.

Q. What is the prognosis in regard to any pain in region of face or ear that is increased by filling mouth with cold or warm water.

A. That it has its origin in disease of pulp.

Q. What are exceptions to such a rule.

A. Some rarer types of neuralgia of branches of fifth pair; also in the earlier stages of apical pericementitis, caused by expansion of gas of decomposition by warm water.

Q. How may thermal changes be prevented in teeth sensitive from caries.

A. By filling with gutta percha—Hill's Stopping.

Q. Where a metallic filling gives rise to irritation what is the remedy.

A. Removal of such filling and insertion of one non-conducting, or sensitive portion of cavity so filled, and remaining portion with metal.

Q. When decay has nearly reached pulp, and dentine over it is very sensitive to touch of instrument.

A. Bathe freely with wood creasote or carbolic acid, and after absorbing surplus with cotton or bibulous paper, cover sensitive surface with prepared chalk, and over this solution of gutta percha in chloroform, asbestos, or oxyphosphate of zinc.

Q. When cause of pulp-irritation is due to malaria, rheumatism, etc.

A. Systemic treatment for such affections.

Q. What is hyperæmia of pulp.

A. The overfilling of its vessels with blood, and no injury results when it does not exceed a reasonable degree; apparent by an uneasy sensation.

Q. But if frequently repeated with inordinate thermal change.

A. Vessels of pulp fail to contract, and remain distended, and irritation and inflammation result.

Q. Does hyperæmia of pulp depend upon lesion of tooth.

A. No, it may occur in a perfectly sound tooth.

Q. What is meant by a partially exposed pulp.

A. Where overlying dentine is partially decalcified and usually more or less discolored.

Q. What are the symptoms.

A. Differ from those of irritated pulp only in degree, and are recognized by extent of decay and touch of instrument.

Q. What is the treatment of partially exposed pulps.

A. Do not expose pulp, and treat as for irritated or sensitive pulp.

Q. Symptoms of an exposed pulp.

A. If simple, no pain except when irritated by foreign matters, and pulp appears as a small, grayish-white, or red object in dentine.

Q. What is treatment of an exposed pulp.

A. Cap with solution of gutta percha in chloroform, adding oxy-chloride or oxy-phosphate of zinc, and when hard a permanent filling; no pressure on pulp. Some cap pulp with paste of carbolic acid and oxide of zinc, and over this oxychloride of zinc; or pure wood creosote and oxide of zinc in form of paste of consistence of cream, with an oxychloride of zinc covering; or lactophosphate of lime paste, or a paste of creosote (or carbolic acid), oxide of zinc and iodoform.

Q. What changes does an inflamed pulp present.

A. The normal pinkish-gray color disappears, and a bright red ensues, followed by dark red and purple.

Q. What change occurs as to character of pain.

A. From an unpleasant sensation indicative of hyperæmia, the pain becomes sharp, and paroxysmal; then more constant and severe, until it throbs with every pulsation of heart.

Q. What may give some relief at this stage—pulpitis.

A A slight exudation from distended vessels, or application of cold.

Q. What may occur when inflammation reaches its height.

A. Suppuration and death, followed by periodontitis and alveolar abscess.

Q. What indicates chronic inflammation of pulp.

A. Where acute symptoms abate, and pulp becomes less sensitive, a condition of ulceration.

Q. What occurs when red blood corpuscles break up, or great extravasation results.

A. Coloring matter is absorbed into fibrillæ, at times to such a degree as to impart a red tinge to the dentine.

Q. How may a tooth thus become darkly discolored.

A. The coloring matter is thus set free in solution, and enters tubuli, and the formation of dark sulphurets give tooth a dark appearance.

Q. When pulpitis assumes chronic form, what is it due to.

A. To a great degree of vitality in system, giving a resisting power to progress of disease.

Q. May the pulp recover from inflammatory conditions.

A. Yes, where moderate extravasations of blood are absorbed, and where inflammatory lymph is not only tolerated, but the tissues are capable of disposing of it.

Q. Why is pain of pulpitis greater at night

A. Owing to difference in the blood-pressure.

Q. What is the treatment of pulpitis.

A. Syringe cavity with solution of carbonate of soda and water to relieve pain; avoid removing any cap of decalcified dentine present; local depletion is sometimes resorted to if pulp is exposed, relieving the pain with the alkaline solution; then application of an antiseptic to destroy micro-organisms, such as capping with paste of iodoform, oxide of zinc, and carbolic acid; then a temporary filling introduced without pressure.

Q. What is the treatment of a wounded pulp.

A. First bathe surface of pulp with calendula or glycerin, and then cap as in case of exposure by other agents.

Q. Is treatment of inflamed pulps universally successful.

A. No, and such systemic affections as anæmia, malaria, scrofula, syphilis, etc., militate against a successful prognosis.

Q. What is to be done if a pulp cannot be made healthy or if inflammation recurs.

A. Devitalize and remove it.

Q. What causes formation of small abscesses in substance of pulp.

A. Suppurative inflammation in cells of membrana eboris; deeper in pulp tissue they form by an aggregation of inflammatory products into masses close to each other, and which coalesce.

Q. In what respect does pain of abscess in pulp differ from pain of hyperæmia.

A. Onset of attack is not sudden, but begins with a slight gnawing pain,

persistently increasing, until it becomes agonizing, and ceases when strangulation occurs, and in from 6 to 24 hours periodontitis occurs.

Q. When a pulp degenerates in structure—mumified, or dry gangrene ensues what is it due to.

A. Long continued chronic inflammation, or development of secondary dentine, and consequent stagnation of circulation.

Q. Does any decomposition attend a degenerated pulp.

A. No, and tooth retains its color.

Q. What is the treatment of chronic pulpitis.

A. Excision of ulcerated portion and capping with iodoform, oxide of zinc, and carbolic acid paste, or first applying strong carbolic acid and then the paste.

Q. What is the treatment of putrescent pulps.

A. First apply an antiseptic, as the iodoform paste, then remove dead pulp syringe canal with tepid water and listerine, then apply iodol, or the paste of iodoform, introduced on a few fibres of cotton, or floss-silk to end of canal, and seal with a temporary filling. Repeat applications until odor of putrefaction is removed.

Q. What other combinations are used for putrescent pulps.

A. Peroxide of hydrogen, alternating with iodide of zinc (xxiv grs. or more to ounce of water); also pepsin paste, eucalyptol, crystals of carbonate of sodium.

Q. If pulps of deciduous teeth become devitalized what is the treatment.

A. Cleanse cavity of decay, remove dead pulp, saturate a pellet of cotton with solution of carbolic acid (5 per cent) 1 ounce, cinnamon or peppermint water 60 drops, place it in pulp chamber, cover with a piece of rubber dam, and press on it with blunt instrument, until fluid appears at fistulous opening, then dry cavity and canals, and introduce solution of gutta percha and chloroform of consistence of cream, by means of a little cotton on broach, and work into canals with a small smooth broach, then fill crown cavity with Hill's stopping.

Q. How are deciduous teeth without fistulous openings to be treated.

A. Same as permanent teeth with blind abscesses (which see).

Q. How are pulpless teeth treated where pulp has been recently devitalized.

A. Freely open pulp-chamber and bathe it with eugenol, or a 5 per cent solution of carbolic acid, or combinations of carbolic acid, oil of cassia and wintergreen, or oil of cassia and guiacol; then using a smooth broach with a fine hook on end, remove all portions of pulp; then disinfect canals with bichloride of mercury (1 to 1¼ grains to ounce of water), or iodoform or iodol, and with oil of cloves and eucalyptol (of each one half ounce); then permanently fill root-canals with gutta percha; or with a piece of 18 or 20 carat gold wire of proper length and finely tapered.

Q. How are pulpless teeth treated where pulps have been dead for some time.

A. Same as in preceeding case, except that greater care is necessary in cleansing canals of dead pulp, that no septic matter shall be forced through ends of roots, and they should be disinfected for a longer time.

Q. How treat pulpless teeth affected with "blind abscesses."

A. Open pulp-chamber thoroughly, and syringe with tepid water; dry

canals carefully and inject peroxide of hydrogen until all bubbling ceases; then dry canals again, and bathe them with eugenol, or oil of cassia; carbolic acid and wintergreen combined, or with oil of cassia and guiacoal, or oil of cassia or iodoform or iodol, or a five per cent solution of carbolic acid and oil of cassia, and pack crown cavity loosely with cotton for three days, or until discharge ceases, if not every fourth day until it has ceased; then tightly pack root canals with one of the disinfecting solutions before named, and fill crown-cavity with Hill's stopping for four or five days; if no soreness of tooth on pressure, or evidence of moisture when canals are wiped out with dry cotton, fill canals permanently with gutta percha or other material; then crown cavity.

Q. How treat pulpless teeth with fistulous openings.

A. Pass a fine smooth broach through fistula to determine if any roughness about ends of roots; if so they should be smoothed by enlarging fistula by compressed sponge tents, and renewed daily, and parts bathed with a four per cent solution of muriate of cocaine, when a fine cut bur of proper size can be used on engine to smooth rough portion of roots, and remove any dead bone if present; then use peroxide of hydrogen in canals, and see that they are open freely at ends, and flood cavity with one of the disinfectant solutions before referred to, and pump it through each canal, if possible, until it appears at fistulous opening, with fibres of cotton around a fine broach as a piston; or make pressure on a piece of rubber dam placed over a pellet of cotton in crown cavity saturated with the disinfectant; then pack canals tightly with cotton saturated with same, and fill crown cavity with gutta percha. After a week or ten days if continued discharge from fistula, repeat treatment; if no discharge treat as for case of blind abscess and fill canals and crown cavity permanently. In all cases apply rubber-dam, and open freely the pulp-chamber.

Q. What preceeds hypertrophy or fungous growth of pulp.

A. Chronic inflammation.

Q. What is the nature of such a polypus.

A. Not so painful as an acutely inflamed pulp, as the nerves do not increase in growth.

Q. What is the treatment.

A. Extirpation, application of nitric acid applied on wooden tooth-pick, and removal of remains, and filling.

Q. What are pulp nodules.

A. The formation of small nodules of secondary dentine within pulp cavity usually in body of pulp, at times in root portion; pain neuralgic in character, or infra-orbital neuralgia, with paroxysms in one or more teeth.

Q. How may their presence be diagnosed.

A. Where evidence exists of no other affection, cold water and percussion may locate the tooth affected.

Q. What is the treatment.

A. Drill into pulp chamber and devitalize and remove pulp, and fill canals.

Q. What is secondary dentine.

A. Dentine formed after tooth is fully developed.

Q. In what does it differ from true dentine.

A. The tubuli very irregular, no centre of radiation as in normal dentine, and more like canaliculi of bone; formed as a continuation of primary den-

tine, sometimes to such a degree as to entirely obliterate pulp; in other cases as nodules in substance of pulp; in former case it is protective.

Q. What is the cause of its formation.

A. Irritation of pulp from the abrasion of mastication, force of occlusion, or a blow.

DISEASES OF MUCOUS MEMBRANE AND GUMS.

Q. What is *Stomatitis.*

A. Inflammation of oral mucous membrane.

Q. What are the symptoms and causes.

A. Reddened, elevated patches sometimes over whole mouth; when it is superficial with little swelling, it is called *erythematous*, in which there is redness and heat, and considerable tenderness; acute pain when deep in tissue; portions of epithelium become opaque with appearance of whiteness in streaks or patches; superficial ulcerations sometimes occur; copious flow of saliva, impaired taste, difficult mastication; whitish fur on tongue. Causes—irritation of any local character, constitutional causes, such as fever, teething, etc.

Q. Describe *Catarrhal Stomatitis.*

A. May be acute or chronic; in children connected with dentition; in adults from mechanical irritants, acid reaction of saliva; extremes of heat and cold; due to exanthema; improper hygienic conditions; poor food; effects of mercury. Symptoms: redness, heat, pain and swelling; pain burning and smarting; some fever; anorexia; diarrhœa with flatulence; impaired taste; may extend to fauces; difficult swallowing; ptyalism; excoriation of corners of mouth; sordes; furred tongue.

Q. What characterizes chronic form.

A. The stroma is involved and structural changes occur; connective tissue of stroma infiltrated with exudations from vessels; mucous membrane indurated and thickened; mucous glands encysted and granular; papillæ of tongue swollen; disagreeable oral secretions; sordes on teeth.

Q. What is the Treatment of Stomatitis.

A. For simple stomatitis of children, emollient washes, such as slippery elm, or pith of sassafras in cold water; when severe, solution of acetate of lead (three grains to ounce of water); bromide of potassium to relieve nervous excitement and fretfulness; borax and honey, or borax and glycerine, or weak solution of alum. For catarrhal stomatitis: remove cause of irritation; alkaline washes, or dilute solution of chloride of zinc (one grain to ounce of water), or of nitrate of silver (same strength). Phenate of soda as a wash or spray; or carbolic acid, one drachm, oil of gaultheriæ, two drachms, peppermint oil three drachms, as a spray.

Q. What is Apthous Stomatitis.

A. Appears first as small whitish vesicle-shaped elevations on inner surface of lower lip, near frænum of tongue, or inside of cheeks, or at times on tongue; the vesicles are surrounded by an inflamed ring at base, and when they break leave a gray surface which heals slowly; the ulcers are shallow and very painful, but cause little or no constitutional symptoms. Common to adults, and women during pregnancy and lactation.

Q. What is treatment of Apthous Stomatitis.

A. Small doses of rhubarb, or citrate of magnesia, and tonics; locally,

nitrate of silver, or nitric acid on sharp end of a wood toothpick, chlorate of potassium solution, alum, borax.

Q. What is Thrush.

A. The inflamed spots soon become coated with small whitish points, which coalesce forming patches, which vary in color, but generally remain moist and clear; the exudation is at first closely adherent and then peels off to be replaced by fresh exudation; vegetable fungi exist, the paracites developing in acid secretions, and hence thrush occurs where oral secretions are vitiated and only by addition of vegetable parasites; common to emaciated children, and in adults follows typhus and malarial fevers, and in last stages of consumption; there is also decided gastric intestinal disturbance.

Q. What is the treatment of Thrush.

A. Neutralize acid conditions to destroy fungi; regulate bowels with rhubarb, and bicarbonate of potash; a grain of quinine every three hours, iron with quinine, as a tonic; locally, apply wash of permanganate of potash one grain to water one ounce.

Q. What is Ulcerous Stomatitis, or Noma.

A. Begins in gums, and extends to cheeks; gums congested, and have bluish swollen appearance; surfaces coated with exudation of pus, fibrin, epithelial scales, and micro-organisms; the grayish-white exudation gives way and also underlying tissue, and mucous membrane looses its vitality, and sloughs off; teeth loosen and drop out, and bone becomes affected in extreme cases; common to children of from one to ten years, who are exposed to bad hygienic conditions.

Q. What is the treatment of Ulcerous Stomatitis.

A. Constitutional—cod liver oil and syrup of lacto-phosphate of lime, tinct. of chloride of iron and quinine. Locally—nitrate of silver, chloride of zinc, or carbolic acid washes, fresh air, nourishing diet.

Q. What is Gangrenous Stomatitis, or Cancrum Oris.

A. A serious disease affecting unhealthy children, constitutional in character; cellular tissue of cheeks infiltrated with pus and fibrin, to such a degree as to become thickened and indurated on inside, and skin externally tense, and glistening, followed by ulceration and gangrene; mucous membrane of cheek presents a dark appearance surrounded by red inflammatory border, the dark portion soon sloughing, and forming an ulcer with ragged, uneven border, and covered with a dark-brown deposit; soft parts and bone become involved, and decomposition leads to formation of sulphuretted hydrogen which gives breath a fetid odor. It is very often fatal, pyæmia occuring followed by hemorrhage, exhaustion and death.

Q. What is the treatment of Gangrenous Stomatitis.

A. Prompt and energetic; internally give chlorate of potassium, five to ten grain doses every four hours, and tonics to keep up strength; parts sprayed with chlorinated soda, or carbolized water; the chief hope is to prevent ulcer from assuming phagedenic character, and it should be destroyed with strong nitric acid, nitrate of silver, acid nitrate of mercury, bromine, or concentrated hydrochlorid acid.

Q. What is Mercurial Stomatitis.

A. A form due to the effects of mercury (salivation); soreness, inflammation and sponginess of gums about necks of teeth (usually inferior incisors are first affected); ulceration; fetid breath; increased salivary secretion; swelling

of salivary glands; slight fever; muscular pains; loss of flesh; coppery taste, ulceration, stiffness of jaws, extension of effects on gum to mucous membrane of mouth and palate, sore throat, ulceration marked about necks of teeth, teeth become loose, often hemorrhage; sloughing may occur and bone of jaw be laid bare; and, in extreme cases, death from exhaustion.

Q. What is the Treatment of Mercurial Stomatitis.

A. Dilute sulphuric acid with bitter tonics; or 5 drop doses of tincture of belladonna three or four times a day, or iodide of potassium, locally, strong solution of bichlorate of potassium, tannic acid, borax, etc.

Q. Describe Syphilitic Ulceration of Mouth.

A. Generally results from constitutional syphilis; initial sore is generally superficial, not often irritating, with discharge of but little pus; at times sore is phagedenic, glands of neck swollen and enlarged ulcer located on tip or side of tongue or on tonsil.

Q. Into what two classes may secondary syphilitic ulcers of mouth be divided.

A. Into such as result from abrasion or injury; and those that first make their appearance on dorsum of tongue, tonsils, or pharynx.

Q. What is the difference between syphilitic ulcers and epithelioma.

A. A syphilitic ulcer is more readily amenable to specific medication, and some evidence of secondary syphilis will be present on other parts,

Q. What is the treatment of Syphilitic Ulceration of Mouth.

A. All rough edges of teeth removed, and if this does not answer, then apply with camels-hair brush three times a day, solution of ten grains of chromic acid to ounce of water, or if such fails, a mercurial course, and abstinence from use of tobacco, and alcoholic drinks.

DISEASES OF PERIDENTAL MEMBRANE AND TEETH.

Q. What is Hypercementosis.

A. Hypertrophy of cementum of tooth.

Q. What are its effects.

A. Great enlargement of roots, and may, if large, cause neuralgic pains, and interfere with extraction of teeth,

Q. Where is the enlarged portion generally located.

A. Near apex of root, but may be on any part of cementum, and of different forms.

Q. What is the cause.

A. Local, (or as some contend) also constitutional irritation of peridental membrane, also from effects on that membrane of occulsion; syphilis is also supposed to induce the affection.

Q. What is the treatment.

A. Iodide of potassium is recommended in earlier stages, but extraction is generally resorted to.

Q. What is Erosion of Teeth.

A. A loss of substance without apparent cause, frequently on labial surfaces of front teeth, characterized by irregular or slight cup-shaped excavations in enamel, which present a smooth, polished appearance.

Q. What is the cause.

A. Very obscure; thought by many to be from acid secretions of mucous follicles; others, that it is an absorptive process from congested condition of

lip which gave rise to an acid secretion, which eroded tooth structures, assisted by motions of lip; electrolysis is also ascribed as the cause; also hereditary syphilis.

Q. What is the treatment.

A. Correct acid condition of secretions; when far advanced, filling the cavities.

Q. What is Abrasion of Teeth.

A. A gradual loss of substance from mechanical causes, such as friction.

Q. What is the treatment.

A. Filling, also the covering of tooth with a gold cap.

Q. What is the condition of abraded dentine.

A. Extremely sensitive, which may lead to irritation of pulp.

Q. What are the remedies used for such sensitiveness.

A. Obtunders of sensitive dentine, such as phosphoric acid, cocaine, creasote, tannic acid, carbolic acid, chloroform, ether spray, chloride of zinc, caustic potash and carbolic acid, or bicarbonate of soda in solution, nitrate of silver, use of hot-air syringe, galvano cautery, or cocaine (alkaloid) ten grains, with sulphuric ether one and one-half drachms. If so abraded as to inflame pulp, devitalize the latter, and fill root canals.

Q. What is Necrosis of Teeth.

A. Death of entire organ, both pulp and peridental membrane.

Q. What are common causes.

A. Death of pulp, mechanical violence, mercury, debilitating diseases, impaired nutrition rendering tooth loose, loss of vascular supply, and great discoloration.

Q. What is the remedy for a necrosed tooth.

A. Extraction.

Q. How may discolored teeth be bleached.

A. Remove all discolored dentine, and apply to cavity either chlorinated lime saturated with acetic acid one part, and water eight parts; or wash out cavity repeatedly with peroxide of hydrogen, and dry with hot air; or place a little aluminum chloride in cavity and saturate it with peroxide of hydrogen; or bathe cavity with solution of permanganate of potash, and then use alternately a four per cent. solution of sulphuric acid and Labarraque's solution of chlorinated soda, and repeat for short time; or one hundred grains of sodium sulphite and seventy grains of boracic acid, dry, and grind together in a mortar, place some in cavity and add a drop of water; or sodium sulphite one hundred grains, and boric oxide fifty-five grains, and mix and use as above.

ORAL SURGERY.

Q. What is Cleft Palate.

A. A fissure existing in upper jaw at birth; often associated with a corresponding fissure involving the lips, the lateral halves of which fail to unite at median line.

Q. What is it due to.

A. Failure of the intermaxillary bones to develop.

Q. What may the fissure involve.

A. The lips, alveolar border of jaw, hard and soft palates, making a common opening of mouth, nose and pharynx.

Q. In extreme cases, where may the cleft extend to.

A. To base of skull.

Q. What characterizes single cleft palate.

A. Fissure occuring to one side of median line and confined to one intermaxillary bone.

Q. What double cleft palate.

A. Fissure occupying median line, the two intermaxillary bones being involved.

Q. What is the effect on certain teeth.

A. The premaxillary bones are joined in an irregular mass, attached to vomer or nasal septum projecting greatly, and as a consequence the incisors assume a malposition.

Q. What effect does such a deformity have upon speech and deglutition.

A. It impairs both.

Q. What is the best period for treatment of cleft palate.

A. Between ages of ten and sixteen.

A. What must precede the cleft palate operation.

A. Repair of hare-lip, to lessen breadth of palatal cleft.

Q. What is operation for closure of cleft in hard palate called.

A. Uranoplasty.

Q. What does it consist in.

A. Freshen mucous edges of fissure; make incision down to bone and close to alveolar process, from immediately outside posterior palatine foramen as far forward as is necessary; raise soft parts between these incisions from hard palate, bring them together in median line, and secure by a suture; control the hemorrhage by pressure; then close fissure in soft palate by sutures, keep sutures undisturbed for five or six days, according to the tension of flaps; the halves of upper jaw may be pressed together by strong clamps and edges united by sutures, thus closing the fissure.

Q. What is Staphylorraphy.

A. The operation of closing a cleft in the soft palate.

Q. What does it consist in.

A. Paring or denuding the edges of cleft, to bring them in apposition; passing the silk sutures through the vellum; dividing the muscles of soft palate to prevent their separating the two halves, and thus have vellum at rest, and then tying the silk sutures, which are one-fourth or three-sixteenths of an inch apart, and are not tied so tightly as to strangulate the tissue.

Q. What is Hare-lip.

A. The failure of lateral portions of upper lip to unite, and is single or double as the fissure corresponds with position of one or both intermaxillary bones, as in cleft palate with which hare-lip is often associated.

Q. What is the treatment of hare-lip.

A. Should be closed as soon as possible after birth, not more than a few months, when parts are more amenable to treatment. The mucous borders are removed, and the raw surfaces united by suture, removing as little tissue as possible, to prevent making lip already short, any more so; and it is necessary to dissect lip and cheek from upper jaw to bring sides of fissure together and keep them so without tension. Professor Tiffany passes through each

cheek the end of a wire suture, catching it to a flat button, to take all strain from line of union, the button resting on thick adhesive plaster to prevent injury to skin.

Q. What are Dentigerous Cysts.

A. Cysts in connection with teeth, and common to either jaw.

Q. When in upper jaw what are they liable to be mistaken for.

A. Antral cysts.

Q. Describe progress of dentigerous cysts.

A. Painless, and of slow growth, bone surrounding them is gradually expanded, and owing to absorption becomes very thin or may disappear, adjacent structures may be displaced until deformity results; sometimes a firm shell of bone surrounds the increasing cyst, but usually fluctuation can be felt.

Q. What is the contents of such a cyst.

A. Clear fluid, more or less brown in color.

Q. What is the treatment.

A. Open cyst freely, remove, if necessary, a portion of the wall, and bring about granulation and contraction. If the cyst is due to an unerupted tooth, make free incision and remove the tooth, when cavity will heal by granulation.

Q. What is the best means for diagnosing a cyst.

A. Make an incision; the non-appearance of a tooth, and the peculiar form of the tumor may also assist in diagnosing.

Q. What is a frequent cause of cystic formation.

A. Displacement of a tooth.

Q. What effect may a misplaced tooth have upon bone.

A. May cause excessive growth, and be the nucleus of a tumor.

Q. The Fracture of what jaw is the most frequent.

A. That of the lower jaw.

Q. What is the common cause of fracture of upper jaw.

A. Direct violence, or a blow upon malar prominence.

Q. What is the treatment for fracture of upper jaw.

A. In many cases no splint is necessary as infiltration from inflammation and stiffening of periosteum will keep edges of fracture in apposition. In cases of very extensive fracture, no pieces of bone or teeth should be removed, but all replaced, and retained by interdental splint, the mouth kept clean; and as the pieces unite they should be placed in their proper position.

Q. What is Fracture of Lower Jaw commonly due to.

A. Direct or indirect violence, and generally through body of bone.

Q. What other parts of lower jaw besides body may be fractured.

A. Ramus, neck of condyl, coronoid process, rarely symphysis.

Q. What is nature of fracture of ramus.

A. If between masseter and internal pterygoid muscles, there will be no displacement of fractured ends; but a fracture just in front of masseter muscle is difficult to retain in position. Often it is accompanied with one of body of bone.

Q. What is nature of fracture of neck of condyle.

A. The condyle is drawn forward by external pterygoid muscle; the zygoma so protects neck of condyl, that its fracture generally results from a blow on the chin.

Q. What is the structure of solid non-malignant Tumors of upper jaw.

Q. What is nature of fracture of coronoid process.

A. Very rare, and could only be due to action of temporal muscle, and is difficult to diagnose; the fractured parts can only be brought together by wiring.

Q. What is the nature of fracture of Body of bone.

A. Depends upon force of the injury and direction of line of fracture. It is generally easy to bring parts in apposition in cases of single fracture; in double fracture, with considerable drawing of parts downward, the middle portion must be secured by wiring it at each end.

Q. What is the nature of fracture of body in front of angle of jaw.

A. The masseter muscle raises the posterior part of bone.

Q. What fracture of the lower jaw is the most difficult to diagnose.

A. Where condyle is broken from rest of bone.

Q. What are the symptoms of fracture of lower jaw.

A. History of injury, pain, crepitation, loss of power or function, irregularity of the arch of teeth, undue mobility, and excessive flow of saliva.

Q. What is the treatment of Fracture of Lower jaw.

A. Four-tailed bandage with or without pasteboard cap for chin, is the most simple and often an effective appliance; an emergency appliance may be made in form of interdental-splint with modeling composition held in partial cups of block tin like impression cups without handles, or metal caps fitted over fractured jaw, or wire splints with ligatures, Kingsley's splint of rubber and wires with free ends, or the interdental rubber-splint.

Q. How does Dislocation of Lower Jaw occur.

A. Either as a unilateral or a bilateral accident, the bilateral being the most frequent.

Q. How can displacement of condyl from glenoid cavity occur.

A. Only forward; never backward or upward or outward without fracture of bone.

Q. What are the causes of dislocation.

A. Violence, spasm of external pterygoid muscle, relaxation of structures composing temporo-maxillary articulation, tooth-extraction, vomiting, yawning, shouting, violence, such as a blow.

Q. What are the symptoms of dislocation of Jaw.

A. Mouth remains open, speech and deglutition impaired, profuse salivation, temporal muscle is stretched and tense above zigoma and, in some cases, the coronoid process can be felt from inside of mouth, a depression in front of ear, great pain, and in unilateral, the symphysis is more on non-dislocated side.

Q. Having occurred once, is it prone to happen again.

A. Yes, on account of joint structures remaining relaxed.

Q. What is the method of reduction.

A. Seat patient in operating chair, head supported by rest, thumbs of operator wrapped in a napkin to prevent bruising, and having them bitten, stand in front of patient and pass thumbs into mouth until they rest on the right and left posterior molar teeth; then make downward and backward pressure, and at same time let fingers rest easily on skin over angles of jaw; the condyles are thus made to glide backward over articular eminence; then close jaws tightly and bandage them. When the dislocation is bilateral and of long duration, it may be necessary to reduce one condyle at a time.

A. Fibrous, cartilaginous, and osseous.

Q. What is the nature of Fibrous Tumors of Jaw.

A. Firm, elastic, at times lobulated; within white, and presenting a structure of interlacing bundles of fibres.

Q. Where are they generally situated.

A. Periosteum of alveolar ridge, and antrum.

Q. What is the usual cause.

A. Irritation, a blow, diseased tooth, etc.

Q. What is their progress.

A. Of slow growth, and inducing more or less deformity and functional interference according to situation.

Q. What is their effect on antrum.

A. When large, expansion of upper jaw and absorption of bone, projection toward nose, mouth, or pharynx, or downward may fill the mouth and cover the teeth, displace the eye, cause epistaxis, and by pressure displace adjoining organs and tissues.

Q. What is sometimes observed in such growths.

A. Calcareous degeneration of a portion.

Q. What is the nature of Enchondroma of upper jaw.

A. A tumor on outer surface of the bone, beginning early in life, of slow growth, no pain, but great deformity on account of displacement of neighboring organs by pressure. Enchondroma is harder, of slower growth and less irregular on surface than fibroma.

Q. What is the treatment of enchondroma.

A. Extirpation of the tumor, and also of subjacent bone.

Q. What is Osteoma.

A. A bony tumor from anterior surface of jaw, antral wall, or, rarely, from palate.

Q. What is its nature.

A. Slow growth, extreme hardness, deformity of adjacent tissues, sometimes invades both antrum and orbit, and becomes quite large.

Q. What is the treatment.

A. Free excision, and removal of portion of subjacent bone.

Q. Where is endostial fibroma most common on lower jaw.

A. Between symphysis and angle, may occupy dental canal and involve inferior dental nerve.

Q. What is the direction of its growth.

A. Downward and outward.

Q. Where is Ivory exostosis generally found.

A. Near angle of lower jaw.

Q. What is Hypertrophy of Gums.

A. An excessive growth of normal tissue as a result of chronic inflammation.

Q. What oral tissues are prone to hypertrophy.

A. Gums and mucous membrane.

Q. What is the pathology of Hypertrophy.

A. An excess of blood which is devoted to the development of extra growths, such as excessive fibrous stroma.

Q. Describe Hypertrophy of gum.

A. The extra growths of the points of gum between teeth and thickened margins of gum around necks of teeth, as smooth, pink or wary masses.

Q. What change often occurs in the alveolar border of bone of jaw.

A. Decided expansion; but no new glandular or epithelial elements in the gums.

Q. What is the localized form of Hypertrophy of Gum caused by.

A. Irritation, lack of cleanliness, presence of salivary calculus.

Q. What is the treatment of Hypertrophy of Gum.

A. Attention to proper hygiene of mouth; excision of hypertrophied gum; use of stimulants and astringents such as tannic acid, or it may be combined with wood creasote; also strong tincture of myrrh; sometimes excision of edge of alveolus is necessary; hemorrhage can be controlled by tannic acid, or powdered sulphate of iron.

Q. What is *Epulis*.

A. A tumor of any kind growing from, or in connection with gum.

Q. Describe a Fibrous Tumor of Gum.

A. Generally Sessile; originates from periosteum of alveolar border, within the socket; slow in growth, painless, may interfere with neighboring structures; smooth, rounded or lobulated, somewhat elastic, of natural color.

Q. What is the treatment.

A. Excision; if periosteum and adjacent bone are involved they should be removed.

Q. To what class do malignant growths of Jaws generally belong.

A. Class of Sarcoma being the most rapidly fatal.

Q. Describe growth and progress of Malignant Tumor of Jaws.

A. May arise either from alveolus, or from body of bone, from surface or centre; if from periosteum, a shell of bone generally partially encloses it; its first increase is slow, and for months the bone may slowly expand, or natural cavities be entered; at length absorption by pressure of the obstructing bone occurs, when growth becomes rapid, and tumor loathsome; outgrowths, protrusion, sloughing, and hemorrhage follow; early but little or no pain, later very severe, especially when trunk of nerve is invaded.

Q. How may benign and malignant tumors be distinguished.

A. By such diagnostic points as cause, rapidity of growth, incorporation of neighboring parts, action on mucous surface (pedunculated), secondary growths, either glandular or otherwise.

Q. What is Epithelioma.

A. First appears as an indurated plane, somewhat elevated, with eroded or ulcerated surface about centre; base and edges of a pink color; generally on gum over lower jaw; painful; extends along the jaw, composed of epithelial cells; lymphatics early involved. Generally due to irritation from carious tooth, or ill-fitting denture.

Q. What is the treatment.

A. Removal of affected gum and adjacent bone by free excision, and application of chloride of zinc paste.

Q. Describe Necrosis of Jaws.

A. Symptoms resemble periodontitis; gum of affected part dark-red or purple color, and swollen; pus escapes from edge of gum around teeth, or from fistulous openings, or sometimes through an opening on cheek or neck, even as low as clavicle; teeth loose and discolored.

Q. What is the treatment of necrosis.

A. Remove all dead parts from living bone, after measures have been resort-

ed to for removal of all local irritation, by free incisions into swollen part to relieve tension, change of air and diet and suitable tonics. Many prefer waiting until dead bone separates from living bone and soft parts; keep mouth clean, syringe with tepid water, and peroxide of hydrogen; use stimulants, tonics and nourishing diet to support strength.

Q. What may cause Ankylosis of Jaw.

A. Tumors of parotid, pharynx or soft palate by their size, may prevent free motion of lower jaw, mumps cause stiffness; reflex spasm of muscles of mastication from eruption of wisdom teeth, and extraction gives relief; diseases of temporo-maxillary articulation; adhesions and cicatrices, from salivation cancrum oris, wounds, result of scarlet and other fevers, etc.

Q. What is the treatment of ankylosis from adhesions and cicatrices.

A. Gradual stretching of cicatrical bands, with many small incisions into such bands; stretching by Goodwillie's gag, teeth should be protected by plates over them; rubber wedges have also been used; the excision of a condyle is sometimes necessary.

Q. What is the treatment of mucous cysts of lips.

A. Evacuate contents with a seton, and the inflammation will cause their walls to adhere; if this fails, a free incision and application of strong tincture of iodine.

Q. What of Ulcers of lip due to herpes or to cracks from cold.

A. Oxide of zinc salve, with occasional application of sweet spts. of nitre.

Q. What causes Inflammation and Suppuration of Antrum.

A. Injury, a foreign body, and disease about roots of superior first and second molar teeth, as the ends of their roots often project into floor of antrum, or are close beneath it.

Q. What are the symptoms.

A. The beginning of affection is usually insidious, unless opening into nose is closed; there is a feeling of distension and heaviness in upper jaw, which the discharge of pus will relieve, which will run out into nose or throat on lying down on one side; bad taste and smell; nausea from pus being swallowed; if the pus cannot escape into nose, there is pain, fever, rapid pulse, distension of walls of antrum and absorption of the walls, perforation, and sudden flow of pus, with relief of symptoms; in extreme cases the eye may protrude and inflammation extend to membranes of brain; both antra may be thus diseased it is a catarrhal inflammation.

Q. What is the treatment.

A. The removal of diseased molar, if it is the cause; if not from a tooth, the second molar should be extracted, and antrum in all cases freely opened (usually ¼ inch opening) through the alveolar cavity and kept clean by frequent syringing.

Q. How can opening from alveolar cavity into antrum be made.

A. By antral trephine, and be prevented from closing by a small silver canula, or a small metal plate fitting portion of ridge about opening, with a small tube attached to fill aperture, and facilitate flow of pus and syringing.

Q. What solutions are used for syringing antrum.

A. First with mild injections, afterwards with gently stimulating ones. Weak solutions of sulphate of zinc and rose water, permanganate of potash (two grains to ounce of water), listerine, warm salt and water, followed by permanganate of potash, carbolic acid one part, oil of sweet almonds fifteen parts on cotton, to be retained for some time in antrum.

Q. What is the cause of Dropsy of Antrum—Hydrops Antri.

A. One or more glands of lining membrane undergoing cystic degeneration.

Q. What is the nature of the fluid.

A. Usually clear; may be thin or viscid and thick, a quantity of cholesterin is present.

Q. What effect does this dropsy have on the walls of antrum.

A. They become gradually distended in all directions, and when pressed crackle like parchment.

Q. What other symptoms.

A. Pain is absent, and affection is not dangerous.

Q. What is the treatment of Hydrops Antri.

A. A free opening into antrum and cyst, evacuating contents, use of drainage tube and stimulating injections, such as are used in inflammation and suppuration of antrum.

Q. What is the treatment of cracked or chapped lips.

A. By constant application of simple or rose water ointment, and a strip of court-plaster if; fissure persists, cauterize with nitrate of silver, first using cocaine.

Q. How treat herpes of lips—cold sores or fever blisters.

A. Apply a little nitrate of mercury ointment.

Q. How are cysts of lips, due to obstruction of mucous follicles, treated.

A. Freely laid open, dried out with lint, and inside painted with strong nitric acid.

Q. What is Salivary Fistula due to.

A. Usually in line of Stenos duct, from injury, operation, or abscess following obstruction; if duct is opened externally, saliva escapes and a fistula is the result.

Q. What is the treatment.

A. Establish opening in the mouth, by passing a probe into fistula and cutting down on it from within, and passing probe daily; then close fistula by touching it with a thermo-or electro-cautery; or a seton may be passed through fistula into mouth, brought out, and the two ends tied; if fistulous opening is small, use fine point of an electric cautery.

Q. How may hemorrhage from wounds of tongue be arrested.

A. By hot water, ice, exposure to air, or tieing ranine artery if it is profuse; then treat wound with weak washes of Condy's fluid, or a paint of iodoform and alcohol.

OPERATIVE DENTISTRY.

Q. What is the recognized principle in preparing cavities for *gold fillings.*

A. To make free ingress; flush walls with antagonizing bearings; retaining grooves or undercuts and pits; cavity-shape slightly larger at orifice than at base; counter-sunk margins; no acute angles; the object being that packing may be accomplished with no interstices between gold and cavity walls—no leakage.

Q. What in preparing cavities for *amalgam fillings.*

A. Form cavity without angles, no flush walls, few, if any, pits; cavity-shape considerably larger inside than at orifice; broad concave undercuts, and

overhanging edges if strong not objectionable, because of spheroidal tendency and proneness of amalgam to draw away from straight walls.

Q. How is Copper Amalgam prepared for insertion.

A. The hard pellets or bars are put into an iron spoon and heated over a flame until mercury begins to ooze out, when it is rubbed up with a pestle in a small glass or porcelain mortar, to make it plastic, and excess of mercury pressed out.

Q. How is non-cohesive gold packed.

A. By wedging.

Q. What shape of Pluggers.

A. Generally smooth more or less of a right-angle and wedge-shaped for introducing; and serrated points for condensing, either for hand pressure with large handles, or for mallet force.

Q. How is non-cohesive gold introduced and condensed.

A. The gold, either in form of strip, rope, tape, fold, cylinder, or mat, is arranged in parallel layers, of sufficient length to extend from bottom to a little beyond margin of cavity, each piece as it is introduced being condensed against wall until a sufficent number fills the cavity tightly; a wedge shaped instrument is then passed into the filling, and the gold pressed laterally towards the sides of cavity, and additional pieces or folds added, until no more can be introduced by wedging, using smaller instruments and smaller pieces of gold during the process; the protruding gold is then condensed with a large serrated plugger, followed by smaller ones until surface is thoroughly hardened; the inequalities of surface are ground down, and surface is burnished and polished, care being taken that no gold overlaps margin of cavity, and that margin is well defined.

Q. How is cohesive gold introduced and condensed.

A. Gold in form of tape, rope, pellet or mat, or parts of the two former, is packed by hand pressure or mallet force, the points of pluggers being finely serrated and rather broad; the gold being annealed, the filling is started in retaining pits, or by placing crystal gold or blocks or cylinders annealed in bottom of cavity, enough in quantity to extend across, and be held in position against walls, the gold being carried to cavity by pliers and not touched by fingers; pieces of gold of convenient length are added to gold in cavity each one cohering to gold against which one end is first brought in contact, and the entire piece then condensed with plugger, by either folding upon itself, or extending along cavity; this process is repeated with piece after piece, the gold being built somewhat higher against walls than in centre of filling until surface is reached, when it is either contoured or made level with margin as case may require.

Q. How is Amalgam introduced and condensed.

A. Cavity dry, and protected from moisture, small pieces inserted by plyers, and brought in contact will all of inner surface of cavity by pressing, rubbing, and gently tapping with the plugger, the point of which should be no larger than the part of cavity into which amalgam is being introduced; by using a mat of bibulous paper or cotton on surface of amalgam after cavity is half-filled, and during subsequent introduction, and rotating the point of plugger on such a mat, the excess of mercury is brought to surface, and the amalgam densely packed, when cavity is thus filled, the cervical wall and undercuts receiving careful manipulation, the surplus is removed, surface

burnished towards edges until amalgam begins to harden, and, at a subsequent sitting, cut down and polished.

Q. How is gutta percha or Hill's Stopping used.

A. Cut in small pieces, which are placed on a porcelain slab and softened, one piece being inserted with a smooth-faced plugger at a time, until cavity is filled, care being taken that the material is only softened to a degree of adhesiveness, and not burned. Resin is sometimes used as a coating for walls of cavity to cause the material to adhere firmly. The surface may be finished with a warm burnisher, or by using on burnisher chloroform or oil of cajeput to soften the gutta percha.

Q. How are the zinc cements oxychloride and oxyphosphate used.

A. Mix liquid and powder thoroughly with a small spatula, on glass or porcelain slab, to the consistence of soft putty, working a little of the powder at a time into the liquid; insert quickly into a dry and well protected cavity, so that the material is brought into direct contact and adheres to walls; remove surplus with a sharp-edged instrument, and refrain from hard burnishing after it begins to harden, so that crystallization may not be interfered with; keep dry for twenty to thirty minutes, which may be better done by coating surface with solution of gutta percha in chloroform, or soft wax.

Q. Why are gold and platinum, beaten together, sometimes used for filling teeth.

A. To insure greater hardness than pure gold; worked like cohesive foil,

Q. Why are gold and tin combined by laying together a sheet of each and rolling into ropes.

A. Claimed that it preserves teeth better than gold alone, more easily packed; used as non-cohesive foil, especially at cervical margins of approximal cavities.

Q. Is amalgam ever used as a foundation for gold in filling.

A. Yes; it should be allowed to harden first.

Q. Where are Gutta Percha fillings indicated as doing best.

A. In soft, highly organized teeth in proximal surface cavities, buccal surface cavities of molars, in labio-cervical cavities of front teeth, and as a non-conducting base for fillings of metals, and for pulp canals.

Q. Where are amalgam fillings indicated as doing best.

A. In all grinding surface cavities of molars and bicuspids, when walls are strong and economy an object, in large cavities on proximal surfaces of molars, especially the posterior; and some use it for filling pulp canals.

Q. Where are Oxyphosphate of Zinc fillings indicated.

A. For temporary fillings, especially when an acid diathesis is present; and for such cavities as indicate a near exposure of pulp, and as a foundation for gold or amalgam, for pulp canals, and for large, badly decayed cavities in molars and bicuspids where little dentine remains.

Q. Where are Tin fillings indicated as doing best.

A. On proximate surfaces of bicuspids and molars, on grinding surfaces, and as a material possessing less conducting property than gold; it is, however, softer than gold and wears from friction more rapidly.

Q. How does non-cohesive gold act as a filling material.

A. It has stood the test successfully for many years; the use of it in simple cavities saves time; it is frequently used at cervical margins of large proximate cavities, and cohesive built on it; it is readily adapted to margins of cavities.

Q. What is the greatest value of cohesive gold as a filling material.

A. For the restoration of contours in all cases, on account of its welding properties, and filling cavities in fissures or sulci of grinding, palatal, and buccal surfaces.

Q. What is the value of Crystal Gold in filling.

A. This gold being precipitated in small granules, renders it excellent for bottom of deep cavities, on account of its ready adaptation and rapidity of insertion; it builds up faster than ordinary gold, and remains in place better during manipulation.

Q. When built into a contour, how does crystal gold compare with ordinary foil.

A. It is granular and lacks tenacity of fibre present in beaten foil.

Q. What distinguishes cohesive from non-cohesive gold.

A. When two pieces of cohesive gold are brought into contact they will weld cold, while non-cohesive will not, but the particles slide over each other without cohering.

Q. How is gold foil graded.

A. When gold has been beaten by ten pound hammer till pieces are four times their original size, they are again cut into four equal squares and beaten with a seven pound hammer to thinness required for filling. Sheets usually cut three and one-half inches square, packed between leaves of books, which are marked according to number of grains in each sheet; number four contains four grains to sheet, number three, three grains; number four will be as much thicker than number three, as one grain of gold will make it. The numbers run from two to two hundred and forty.

Q. In Simple approximal cavities of superior incisors what are necessary.

A. Sufficient room, and such a preparation as will leave strong walls with little undercut.

Q. When a cavity in proximate surface joins a labial cavity near neck of tooth what is the method.

A. Fill labial cavity first, then proximal, and join the two in one operation.

Q. When non-cohesive gold is to be used on cervical wall as a foundation for filling, how should such wall be prepared.

A. Made smooth with no pits or grooves.

Q. Give some general rules for the formation of cavities.

A. Remove all frail overhanging walls; if it is best to save such, strengthen with zinc cement; remove all unsupported enamel at cervical wall, and make this wall at right angles to surface of tooth; make walls of cavities in front teeth according to conditions present, and make undercut at cervical wall, and also at cutting edge wall to retain filling; undercut or groove lateral walls of proximal cavities in bicuspids and molars, and, if grinding surface is left intact, make a slight undercut in wall under it; if cut through, extend cavity on grinding surface towards centre or farther, with a dovetailed outline; if cavity is large, lateral walls may be cut away so that gold may come in contact with adjoining teeth, leaving margins free; round and smooth all angles; for cohesive gold make retaining pits, with a small, flat, square-pointed drill, near enamel, but in dentine, and usually parallel with long axis of tooth; do not drill toward the pulp; make depth of retaining pit, equal to diameter of drill; one retaining pit at middle portion of cervical wall of a proximal cavity in bicuspids, is sufficient; for non-cohesive gold no retaining pits; in grinding

surface cavities make walls nearly parallel, and slight undercuts at opposite points; same with cavities on palatal, buccal and lingual surfaces.

Q. How is the gold packed in proximal surface cavities of bicuspids and molars.

A. After first pieces of non-cohesive gold are secured in place against cervical wall, by hand-force or pressure, the mallet is used and they are made to overlap border of cavity, the next layer of pieces is packed in same manner, the layer in each case being commenced by packing a piece of gold at either side and securing the two by a larger one in the middle, which slightly overlaps the first pieces; when the second layer is completed, cohesive gold is incorporated, but this should be done before the complete consolidation of the pieces of second layer of non-cohesive; the cohesive gold is then packed in such a manner that too much fullness at lower portion of filling is avoided, by the maintenance of a slight concavity of the surface as the filling is built up; the gold should be built up slightly fuller than edge of cavity and be condensed somewhat over the margin.

Q. How prepare and fill approximal surface cavity of an incisor where both labial and palatal surfaces are to be removed.

A. Make labio- and palato-angle extensions of cavity along cervical wall, with grooves or undercuts, a slight concavity in cutting-edge wall, and a groove or undercut along palatal border, with a slight groove also in dentine along labial border—the grooves being continuous around borders of entire cavity, but those at angles of cervical wall deeper than along palatal, labial, and cutting edge. After filling in and connecting the gold occupying the grooves in cervical wall, the lost palatal wall should be restored, and there is then left a more simple cavity to complete the filling of; then build over floor of cavity and into groove of cutting edge.

Q. How prepare and fill a cavity where the palatal, labial and cutting edge walls are removed.

A. Prepare cervical wall as in preceeding case with grooves along border but extending deeper into labio- and palato-angles; the presence of a live pulp prevents much interference with remaining surfaces and but slight grooves can be made, if any, along labial, palatal, and cutting edge borders; resort must be had to a gold screw to retain such a filling, as there is a loss of tooth structure to almost the plane of the pulp-chamber. First pack the gold solidly into the retaining grooves of cervical wall connecting them along cervical border from palato to labio-angles; then drill through the gold thus placed and into the dentine beyond, tap the drill-hole and insert screw tightly into place, and cut it off just short enough not to reach to line of cutting-edge, after which complete the filling with small pieces of gold, taking care to pack gold properly around screw and to contour.

Q. How prepare and fill a cavity where so much of incisor crown is removed as to leave but one angle at cutting edge; generally the result of fracture of half the crown of tooth.

A. The cervical portion of cavity is prepared as in preceeding case where undercuts or grooves in palato- and labio-approximal angles are united by one less deep along cervical border; a retaining extension is made on the other side of pulp in surface under remaining angle at cutting edge; a gold screw is inserted through gold packed in grooves of cervical wall, and into the dentine beyond the gold, and the remaining gold packed in same manner

as in preceding case, the lost portion of crown being thus restored; in all such cases where the pulp is dead the root canals are first filled and a portion of pulp-chamber utilized for retention of crown cavity filling..

Q. Where both angles of crown at cutting-edge and palatal and labial walls are removed, with a prolongation of remaining part of crown in centre.

A. A cavity of this nature needs no retaining screws, as the cervical walls on both sides of crown are prepared in same manner as preceding cases, and the slight portion of cutting-edge being shortened the gold is built across from one approximal cavity to the other, forming a gold cutting-edge of a depth sufficient to give strength, and also support to the two approximal fillings which are thus joined together, and crown contoured.

Q. Where caries extends from approximal to grinding surface—a compound cavity of bicuspid or molar.

A. By a fissure drill or chisel the portion of cavity on grinding surface is opened by cutting down overhanging edges, dovetailing and counter-sinking margins, following decay and sulcus to its opposite extremity, and making wall more or less parallel; the approximal portion of cavity is extended into the cementum; if decay has advanced near margin of enamel; the cervical wall is made parallel with grinding surface; grooves are cut in palatal and buccal walls extending up under cusps of grinding surface taking care not to weaken the palato- and bucco-approximal angles, where approximal portion of cavity joins the grinding surface portion. The cervical wall is first covered by a large mat or pellet of non-cohesive gold, slightly overlapping the margin, and partly condensed against wall by hand-pressure, using a foot plugger; this is covered with another mat of same gold, and malleted down, so that whole surface and border are well covered, the under layer of gold serving as a soft cushion which adapts itself to irregularities of surface; some use number sixty foil for second layer; the approximal portion of cavity is then packed with gold, especial care taken to carry gold well into grooves in palatal and buccal walls, and against sides of cavity, and build up towards grinding surface and under cusps, then over angle of tooth into grinding surface portion, the first layer of gold extending over the whole of this surface and condensed against the bottom, and then built up against the side and end walls until all portions of the cavity are filled.

A band matrix is almost indispensable in introducing large fillings which restore parts of crowns of molars and bicuspids.

Q. How is a cavity formed in cutting edge of an incisor owing to abrasion or erosion.

A. Make labial edge smooth with a corundum wheel or stone, dress down palatal edge freely for strength of filling against opposing teeth; with a rose burr cut a groove in dentine around margin of cavity, not touching enamel, drill retaining pit at each end of groove; commence filling with the pits and carry gold across bottom of cavity from one pit to another and build up against walls higher than centre until margin of cavity is reached, when the gold should overlap border all around, and the contour cutting-edge completed. Gold retaining screws are sometimes used in such cavities when proximity of pulp interferes with the proper shaping.

Q. How are labial surface cavities of incisor and cuspid prepared and filled.

A. Give a circular or oval shape to orifice by rose drill, smooth and counter-

sink margins, drill a small retaining pit in each end with a slight undercut in dentine joining the two pits, but touching edge of enamel; fill retaining pits first, then carry gold over bottom of cavity and against walls, and when margin is reached continue the packing until the margin is slightly overfilled, and then reduce surface of gold in conformity to shape of labial surface of tooth.

Q. Where labial surface cavities extend under gum.

A. A clamp may be necessary to hold dam in position after the latter is secured by a ligature above cervical margin. The cervical margin of cavity should be undercut, and a piece of non-cohesive gold placed against cervical wall, and its inner border carried into undercut, the opposite or margin towards cutting-edge is covered in same manner, and when both are secured, cohesive gold is used forfilling in and building up to and a little outside of margin for surface finishing.

Q. How are gold angles of cutting-edges built on incisors.

A. A cavity of this kind includes both proximal surface and cutting edge to a greater or less degree; where length of crowns will admit, they may be shortened to some degree and thus lessen the amount of gold visible; if this is not possible, then cervical wall of approximal portion of cavity is undercut and the groove continued from that wall around labial and palatal borders in the dentine within the enamel edge and the enamel margin made uniform and smooth and slightly bevelled; gold is then packed against cervical wall and condensed, and a hole drilled through it into the dentine for a retaining screw, which should be of a length to just reach within line of angle at cutting-edge; the gold in small pieces is then built securely around screw and made to overlap border of surfaces and cutting-edge, and contouring completed in conformity with all the surfaces and cutting-edge.

Q. How is a cavity on approximal surface of incisor extending to cutting-edge prepared and filled.

A. Enter cavity from palatal surface; cut away unsupported enamel from labial surface; leave as much labial wall as quality of tooth will admit of; remove carious part, smooth walls and bevel them outward; make cervical wall at right angle to cavity and leave it solid, not undercut, as the finished gold filling following outward bevel of enamel edge of this wall gives strength at such a weak point; make such an undercut in labio-cervical portion as will not weaken the cervical wall; do not approach pulp by an undercut in cervical wall; have main undercut formed well up under cervical portion of labial wall, make a groove to extend toward, but not to cutting-edge, in dentine, and following labial wall; at safe distance from pulp, this groove may cross cavity; or by use of a retaining pit which extends in direction of pulp rather than toward cutting edge, it connects with a groove which follows the palatal to the cervical wall where it ends in a retaining point or larger undercut at junction of palatal and cervical walls; often a groove cannot be made between basilar ridge and pit between pulp and cutting-edge, but a well defined one can be formed over basilar ridge; begin packing the gold in labio-cervical undercut.

Q. What are Porcelain Disk or Inlay Fillings.

A. Disks of porcelain of a size to fit cavity to avoid a show of metal; may be ground from an English tooth; or carved and baked specially for case.

Q. How are they introduced.

A. Walls of cavity made perpendicular, or a little undercut, outline of cavity circular or oval, no angles; after fitting inlay to cavity (loose, if gold foil is to be filled in around it; close fitting, if it is to be secured with zinc cement or gutta-percha), it is ground to conform to surface of tooth, and then polished.

Q. How is the Pulp removed from Canal.

A. By immediate extirpation with a barbed-broach, or drawn-temper broach with point bent to form small hook; the instrument is passed along side of pulp, after it is obtunded by atropine, cocaine, carbolic acid, or chloroform, then rotated and withdrawn; general anæsthesia by nitrous oxide may be resorted to.

Q. How are Roots prepared for Filling.

A. After complete removal of pulp, if canals are of normal form, they need not be enlarged; if otherwise, they may be enlarged one fourth or one third of their length; the diameter of foramen may be determined by a fine hook broach; and a drill a little larger be used; the length of canal may be determined by measuring the distance on the broach when its hook passing through foramen catches on end of root.

Q. How may a broken broach be removed from canal.

A. By arming a barbed broach with a few fibres of cotton, and passing it on one side of broken piece; or, if possible, grasping it with canal pliers; if piece cannot be removed, fill canal with tincture of iodine and close crown cavity with gum sandarach on cotton; the iodine in a few days will reduce the iron to an oxide which is readily removed by a drill.

Q. What materials are used for filling root canals.

A. Gold, tin, amalgam, gutta percha and oxychloride or oxyphosphate of zinc; gold and tin foils are rolled into cylinders or points about size and length of canal; gutta percha is used in form of solution in chloroform, or in form of small cones; oxychloride and oxyphosphate of zinc are used in form of a thin paste.

Q. How are these materials introduced.

A. Gold and tin are carried to place by a fine canal-plugger, and gently condensed; gutta percha solution and zinc cements are introduced by means of cotton wound on a fine broach, or cotton thread may be saturated with these cements; gutta percha in form of cones with square ends, which are dipped in chloroform and pressed into place with canal plugger; amalgam may also be introduced with a canal plugger; some prefer filling upper third of canal with gold or tin and remaining portion with gutta percha, or zinc cement.

Q. How are teeth prepared for Replantation and Transplantation.

A. Extract with care, wash in tepid water, remove any unhealthy membrane from root, cut off a small portion of end of root, enlarge foramen in end, remove pulp, fill root canal, first preparing and filling crown cavity if any exists.

Q. How are teeth replanted and transplanted.

A. Clean alveolar cavity of all blood, syringe with warm salt water, bathe tooth in solution of bichloride of mercury, one two-thousandth; press firmly into cavity; have patient to close jaws to secure proper occlusion; secure tooth with ligatures to adjoining teeth.

Q. How are teeth Implanted.

A. By cutting a hole in gum, and forming a cavity of proper size in the alveo-

lar process with drill and burrs, and the tooth (recent or dried) inserted and secured in the made alveolar cavity by ligatures to adjoining teeth.

Q. What characteristics are peculiar to teeth difficult to extract.

A. Short thick crowns, incisors thick and strong which occlude with the inferior, small or constricted necks and long roots, with dense process, hypercemtosed teeth, superior cuspids, also third molars partly erupted.

Q. What accidents are liable during extraction.

A. Fracture of teeth, fracture of alveolus, removal of wrong tooth, hemorrhage, syncope, dropping of tooth down throat, undue laceration of gums, gangrene of alveolar cavity, dislocation of lower jaw.

Q. How are roots extracted.

A. By using forceps with long, narrow, sharp beaks, by elevator, by cow-horn forceps, alveolar forceps, cutting through process to root, elevator forceps.

Q. What is Ranula.

A. Large cystic tumor under tongue on side of frænum linguæ; semi-translucent, soft, and over it large dilated veins, painless, containing clear, glairy fluid; due to dilation of ducts of salivary glands, and to obstruction of ducts of sublingual glands.

Q. What is the treatment.

A. Destroy lining membrane of cyst by caustics, after excising a portion of cyst-wall; injection of tincture of iodine ten parts, water ten parts, and iodide of potassium one part; stick of nitrate of silver to interior of sac.

Q. What are Sublingual Cysts.

A. Situated between tongue and lower gum, may be mistaken for ranula, grow slowly, painless, contain a thick, putty-like material, sometimes purulent and offensive.

Q. What is the treatment.

A. Excision.

Irregular Arrangement of Teeth.

Q. With what set of teeth should the prevention of malposition begin.

A. With the deciduous.

Q. What knowledge is necessary.

A. That of periods of eruption of both sets of teeth, and of the indications of nature.

Q. Can definite rules for correction of irregularity be closely adhered to.

A. No, as every case almost presents its own peculiarities.

Q. In what direction have the teeth, if unobstructed, a tendency to move.

A. Forward to median line.

Q. What must govern treatment of irregularity.

A. Age, condition of teeth, constitution of patient, character and degree of irregularity.

Q. At what age is the moving of teeth comparatively easy.

A. Eleven or twelve years; at eighteen or nineteen slower; more difficult as age advances.

Q. What may result from irregularly arranged teeth.

A. Irritation of gums, lips, or cheeks, difficulty in cleansing, defective

mastication, sometimes speech, disposition to dental caries, deformity more or less conspicuous according to nature and degree of deviation.

Q. Are deciduous teeth prone to irregularity.

A. No, unless associated with some characteristic deformity.

Q. For a regular and well developed set of teeth what is necessary.

A. Ample and coincident development of maxillæ.

Q. What may give a different result.

A. A trifling accident, as a fall, may result in inversion of an incisor and later impair entire occlusion.

Q. What effect has inherited or transmitted peculiarities.

A. Many forms of irregularity owe their origin to such causes, and it is the result of the same law of nature which gives form and features of progenitors to the offspring.

Q. Can such a tendency, even when transmitted for generations, ever be stamped out.

A. Yes, many think so.

Q. What may be the effect of the unabsorbed portion of deciduous root, or a mere spicula.

A. It may cause a permanent tooth to deviate and, eventually, be the cause of impaired occlusion of all the teeth.

Q. Into what two classes are causes of irregularity divided.

A. Congenital and acquired.

Q. What are congenital causes.

A. Want of proportion between teeth and jaws. Excessive vaulting of palate due to arrest of development of sphenoid bone, or defective growth of vomer, defect in conformation of jaw, such as elongated lower jaw, failure of permanent teeth to erupt, retarded eruption of teeth, asymmetry in body of bone of lower jaw, excessive growth of maxillary bones, hereditary transmission.

Q. What are acquired causes.

A. Premature extraction of deciduous teeth, retention of obstinate deciduous teeth, thumb-sucking, sleeping with mouth open, injudicious extraction of permanent teeth.

Q. At what period is the correction of irregularity attended with the most satisfactory results.

A. Previous to sixteenth or eighteenth year.

Q. How may a permanent central incisor accommodate itself when aperture left by deciduous central is not as wide as crown of erupting tooth.

A. By pressure on crown of loose deciduous lateral.

Q. What may cause protrusion of superior permanent canines.

A. A contracted arch, or premature extraction of deciduous canines; canines prone to malposition on account of late eruption.

Q. Why are bicuspids not prone to irregularity.

A. Owing to situation between roots of deciduous molars.

Q. What is a general rule in regard to extraction of a permanent tooth to make room for a permanent canine.

A. If space between lateral incisor and first bicuspid is less than a space equal to width of crown of canine, then the extraction of first bicuspid is justifiable; if space is as wide as crown of canine, then extract second bicuspid provided both bicuspids are sound; if sixth year molar is decayed to such a

degree that it cannot be permanently preserved, then its removal is justifiable, and not one of the bicuspids.

Q. What may cause deviation of bicuspids.

A. Lateness of eruption; the cuspids meeting no resistance fall into natural position while bicuspids erupt inside of arch, forming an angle.

Q. Can the jaw at times be expanded so as to render unnecessary the removal of a permanent tooth.

A. Yes.

Q. In extracting a permanent tooth to make room for another, what must also be considered.

A. The articulation or occlusion of the teeth in question.

Q. Why are bicuspids superior to the sixth year molar.

A. Owing to location and durability.

Q. In what respect is a sixth year molar superior to at least one of the bicuspids.

A. In mastication; and the two bicuspids resembling each other, the loss of one is not so noticeable if the molar occupies its position.

Q. At what period may a sixth year molar be extracted with expectation of twelfth year molar occupying its place.

A. Between tenth and eleventh years, or just before eruption of twelfth year molar.

Q. If sixth year molar remains perfect until twelfth year, what is the probability.

A. That it may be as valuable as the twelfth year molar.

Q. Should it ever become necessary to decide between removal of a lateral incisor or canine, what is the rule.

A. If a lateral incisor is decayed or loose, or shuts within lower teeth, then it should be removed; and it is a very rare case which would justify the removal of a canine, if in a perfect condition, and only if lateral incisor was perfect in structure and position, and there were good reasons for retention of both bicuspids and sixth year molar, and there was no space for both lateral and canine.

Q. What is Kingsley's rule in regard to the extraction of permanent teeth for correction of irregularity.

A. That a pair of any of the teeth may be removed, except the canines of both jaws, and the superior central incisors; that the upper lateral incisors and any pair of lower incisors may be removed without serious detriment to mouth.

Q. To what may the undue prominence of superior incisors be due.

A. To both congenital and acquired causes—congenital, when it results from a contracted or malformed arch; acquired, when from thumb or nipple-sucking.

Q. To what may obliquity of an incisor be due.

A. To a retained deciduous tooth, or contracted arch.

Q. Will the premature and delayed extraction of a sixth year molar, which it is impossible to preserve, cause irregularity of adjoining teeth.

A. Yes, may result in the tipping over of crown of second molar, and second bicuspid by force of occlusion, or obliquity of second bicuspid.

Q. With what condition of organism and tissues is the V shaped arch often associated.

A. Delicate organism, enlarged tonsils, spongy gums and offensive breath.

Q. May it be regarded as both inherited and acquired.

A. Yes as it is apt to affect near relatives of same generation, and is also caused by thumb-and nipple-sucking.

Q. Describe a V shaped arch.

A. Incisors project unduly, and assume an oblique position resting on or protruding over lower lip; bicuspids and molars approach each other from opposite sides, so that vault of palate is greatly constricted.

Q. What may cause superior front teeth to shut within inferior.

A. An unusually small upper maxilla: unnatural length of lower maxilla from excessive development; retarded eruption or inverted position of upper teeth; or the unnecessary extraction of superior canine teeth.

Q. What other form of irregularity differing only in degree, but due to same causes, may result.

A. Teeth of both jaws meeting edge to edge.

Q. What is the form characterized by imperfect occlusion, the posterior molars alone antagonizing, due to.

A. A peculiar conformation of one or both jaws, as excessive development of posterior portion of alveolar ridge; or, according to Tomes, enlarged tonsils causing mouth to be kept open.

Q. How should appliances for correcting irregularity be constructed.

A. As simple as possible, to save time and labor; as light and delicate as is consistent with strength and the force they are to exert; capable of exerting traction in proper or required direction, and productive of the least irritation possible.

Q. Describe a saddle-shaped arch.

A. Maxillary bone too narrow at anterior extremity for teeth suited to a more expanded jaw; vault high and narrow; molars pushed forward leaving only space for one bicuspid, which teeth are turned inward toward palate; may include one or both arches.

Q. What should be the first operation in correcting irregularity.

A. After careful examination, obtain plaster models of both jaws and study them carefully to determine the degree and direction of force to be applied, point of anchorage which must afford greater resistance than teeth to be moved.

Q. How may the resistance of a deviating teeth be lessened.

A. By first loosening them by wedging with rubber, wood, cotton etc.

Q. How should the force be applied to the tooth to be moved.

A. Either at right angles to long axis of root, or at an angle of forty-five degrees; the greatest pressure being required in direction of greatest resistance.

Q. How great should be the force exerted in moving a tooth.

A. Enough to cause absorption of bone without producing inflammation to any great degree; in some cases slight inflammation is desired.

Q. At what age is too rapid movement of teeth objectionable.

A. Over twenty years of age.

Q. Is the practice of drilling holes in teeth for anchorage advisable.

A. No, as a band or a cap can be secured to a tooth with oxyphosphate of zinc, in which holes may be drilled, or loops or hooks soldered on at any point desired.

Q. How may teeth within arch be brought out.

A. By appliance acting on the principle of the lever, such as a wedge, a bend band acting as a double lever, a straight bar.

Q. How may a tooth be rotated.

A. On principle of wheel and axis, such as a gold band around tooth with an arm bent at right angles extending from it to deviating tooth, and a rubber band attached to end of arm, the latter being bent as tooth rotates.

Q. What is the principle of the inclined plane.

A. A plane surface inclined at any angle, and fitted to lower teeth as fulcrum when upper teeth are to be moved outward.

Q. What is the principle of the screw.

A. It works in a hollow cylinder with a corresponding thread cut inside; it is very effective in spreading arch and forcing obstinate teeth to new positions, and free end should act against a band of metal encircling crown of tooth to be moved; jack-screws, such as the McCullom and Lee and Bennett are used.

Q. How is elastic force obtained.

A. By rubber, and spring of metals; rubber bands cut from tubing.

Q. What are ligatures.

A. Cords, strings or wires for binding teeth while regulating, for attachment of other appliances to teeth, or for holding them in place after they have been moved; of silk, linen, etc., care being taken in tying the knots to prevent slipping, etc.

Q. What is the Patrick method based on.

A. Elasticity or spring of a platinized gold band or wire, anchored to strong teeth by bands, the force of the bow-spring being applied to the teeth by wedges, hooks, T bars, and catches slipping along spring.

Q. What is the Positive or Farrar System.

A. Consists in bringing to bear upon teeth to be moved a continuous force by means generally of the screw for a positive and definite result; that a tooth should be moved a certain distance as far as it is safe or proper, at one operation, and then retained immovable until another operation, so as to compress tissues in front of advancing tooth to such a degree that there is absorption without inflammation, thus making place for the moving tooth, while at same time a deposition of bone takes place behind the tooth which tends to retain it.

Q. What is Byrnes method.

A. Taking advantage as a motive power, of the spring or elastic force of thin gold bands.

Q. What is the Coffin method.

A. The adaptation of a vulcanite plate to hard palate, and over posterior teeth, the plate being split in half after vulcanizing; the halves are connected by a piece of piano-wire bent into shape of letter W, the ends flattened and imbedded in the rubber plate; after plate has been worn for a few days the two halves are separated by being stretched apart, and the wire is thus converted into a spring of considerable power and constant tension, by which the arch is expanded laterally. The same principle is applied to lower jaw and two curved wires lie along the lingual aspect, the plate being divided at median line.

Q. What is the Talbot method.

A. Increasing the elasticity of the wire by coiling it from one to three times

around a mandril, the coil working like the mainspring of an Am. watch; the ends of the two arms fit into holes in rubber plate, or in bands of metal attached to teeth with zinc cement. The same appliances modified as to form, are effective in regulating individual teeth, as well as expanding arch.

Q. What appliances are used for rotating teeth.

A. The screw-wrench of Farrar, the small appliance of Guilford consisting of two bent pieces of gold plate soldered together in centre, the free ends acting as springs, and the short ends forming a T to retain appliance in connection with the spring ends acting upon opposite sides of teeth; and the Talbot appliance consisting of a band of platinum around crown of tooth, with a tube soldered lengthwise with band, which is secured by zinc cement; a piece of piano-wire is passed into tube and allowed to extend to an adjoining tooth and acts as a spring, being bent daily.

Q. For what other purposes are appliances constructed.

A. To move both crowns and roots, to compel the full eruption of crowns, to correct protruding jaws and teeth, to shorten length of teeth by pressure, and for retaining teeth in new positions.

Q. What do retaining appliances consist of.

A. Rubber plates, same with metallic attachments, metal bands in connection with bars, etc.

METALLURGY.

Q. What kind of bodies are the metals.

A. Elementary Bodies.

Q. How many elements are now known.

73 A. Sixty, and are divided into metallic and non-metallic.

Q. How many of them are metals.

A. Fifty-two.

Q. How many are employed in true metallic condition.

A. Fourteen—Antimony, Aluminium, Bismuth, Copper, Gold, Iron, Lead, Magnesium, Mercury, Nickel, Platinum, Silver, Tin, Zinc.

Q. How many are used in medicine, for coloring pigments, and for alloys.

A. Twelve—Arsenic, Barium, Cadmium, Calcium, Chromium, Cobalt, Lithmium, Manganese, Potassium, Sodium, Titanium, Uranium.

Q. What metals contribute to the maintenance of animal and vegetable life.

A. Aluminum, Calcium, Iron, Magnesium, Manganese, Potassium, Sodium.

Q. Into what two classes are metals divided.

A. Into Noble and Base.

Q. What are Noble Metals.

A. Those capable of being separated from combinations with oxygen by only heating to redness.

Q. What are Base Metals.

A. Those whose compounds with oxygen are not decomposable by heat alone.

Q. How many Noble Metals.

A. Ten—Mercury, Gold, Silver, Platinum, Palladium, Ruthenium, Rhodium, Iridium, Osmium, Davyum.

Q. What is a metal.

A. An element generally solid at ordinary temperatures (mercury is an exception), fusible by heat, insoluble in water, with a metallic lustre, and properties of conducting heat and electricity.

Q. How do the colors of metals differ.

A. From white, to yellow, red, gray and bluish.

Q. What is the lustre of metals due to.

A. Perfect opacity, by which rays of light are reflected from surface.

Q. Do metals have Odor and Taste.

A. Yes, arsenic has odor of garlic; iron copper and zinc gives forth odors when heated, odor and taste depend upon voltaic action.

Q. Are all metals fusible.

A. Yes, but temperature at which they melt differs greatly.

Q. What does the specific heat of metals consist in.

A. The amount of heat required to raise equal weights of different metals from same to another given temperature.

Q. Do metals expand or contract when heated.

A. Expand, but not uniformly, and within certain limits of temperature, the degree of expansion is proportionate to amount of heat to which they are subjected.

Q. Have metals great heat conducting property.

A. Yes, they are the best of all solid bodies.

Q. Taking Silver at the standard of 100, what is the order of the following metals used in dentistry.

A. Copper, 73.6; Gold, 53.2; Tin, 14.5; Iron, 11.9; Steel 11.6; Lead, 8.5; Platinum, 8.4; German Silver, 6.3; Bismuth, 1.8; Fusible metal, 2.8.

Q. What is the power of metals to conduct electricity.

A. Nearly in ratio of their capacity of transmitting heat, and in the following order: Silver, copper, gold, zinc, iron, tin, lead, antimony, bismuth.

Q. What is meant by Malleability.

A. The property of a metal to be extended in all directions by hammering or rolling.

Q. Which is the most malleable of all metals.

A. Gold, then in the following order—silver, tin, copper, cadmium, platinum, lead, zinc, iron, nickel, palladium, potassium, sodium, mercury.

Q. What is meant by Ductility.

A. That property by which a metal can be drawn into a rod or wire.

Q. What is the order as to ductility.

A. Gold, silver, platinum, iron, copper, zinc, tin, lead, nickel, palladium, cadmium.

Q. What is meant by Tenacity.

A. The power of a metal to sustain weight and resist rupture when a rod or bar is subjected to tension.

Q. What is the order as to tenacity.

A. Iron, copper, platinum, silver, gold, zinc, tin, lead.

Q. Will all metals assume a crystalline form.

A. Yes, under favorable circumstances.

Q. How may elasticity and sonorousness be conferred on metals.

A. By alloying.

Q. Are all metals volatile.

A. More or less, but only a certain number are capable of being easily converted into a state of vapor at the highest temperatures.

Q. What agents are capable of volatizing a metal.

A. Voltaic current, oxyhydrogen blow-pipe flame, and concentration of solar rays in focus of lens.

Q. What are Alloys.

A. Compounds composed of metals capable of uniting with one another.

Q. What is the nature of alloys.

A. Usually harder and more fusible than the metals of which they are composed.

Q. What may an alloy consist of.

A. A solidified solution of one metal in another; a chemical combination; a mechanical mixture; a solidified solution or mechanical mixture of two or all of the above.

Q. What is the tendency in a simple mechanical mixture.

A. To separate; some metals form mixtures so mechanical that if allowed to stand after fusing they will separate. Example: Lead and zinc, the lead having highest specific gravity settles to the bottom.

Q. Is the density of an alloy always the mean of its constituents.

A. No, as resulting number is sometimes equal to, or greater or less than the theoretical mean.

Q. What effect does alloying have upon the color.

A. It is always changed.

Q. Does alloying have any effect upon malleability, ductility, and tenacity.

A. Yes very much. Examples: Gold and platinum alloy is much harder and elastic; a very little lead will destroy the ductility of gold.

Q. What effect has alloying upon tenacity.

A. It increases it; and also increases the hardness.

Q. What effect has alloying upon fusibility.

A. The fusing point of an alloy is less than that of the least fusible metal forming one of the constituents.

Q. Why is this the case.

A. Because the attraction existing between the particles of a mixture will be sooner overcome by repulsion, than will the attraction in the case of a homogeneous body.

Q. What is the composition of Gold Coin.

A. Gold 90, copper 10.

Q. What of Silver Coin.

A. Silver 90, copper 10.

Q. What of Brass.

A. Copper 67 to 72, zinc 28 to 33.

Q. What of German Silver.

A. Copper 50, zinc 25, nickel 25.

Q. What of Type Metal.

A. Lead 80, antimony 20.

Q. What of Pewter.

A. Tin 92, lead 8.

Q. What of Plumbers' Solder.

A. Tin 67, lead 33.

Q. When an alloy contains a volatile metal what is the effect of heat upon it.

A. It decomposes it.

Q. What is meant by Liquation.

A. The separation of metals, such as tin, lead, zinc, etc., by melting.

Q. What is the action of an acid on an alloy.

A. More energetic than upon a simple metal.

Q. What is the combined effect of action of heat and air on alloys composed of two metals, one readily oxidizable and the other having less affinity for oxygen.

A. Are readily decomposed, the first being rapidly converted into an oxide.

Q. When a noble and a base metal are to form an alloy, what is the method.

A. The noble metal should be fused first, the base metal then added and the whole covered with powdered charcoal to prevent oxidation, and then thoroughly mixed by stirring.

Q. When adding brass, etc., to gold or silver in making solders, what is the method.

A. Fuse the gold or silver first with sufficient quantity of borax, then the brass in form of wire quickly added, and the borax covering the liquid mass will prevent oxidation.

Q. What is an amalgam.

A. An alloy of mercury with one or more other metals.

Q. What qualities should a dental amalgam possess.

A. Strength and sharpness of edge, maintenance of color, retention of shape, no undue expansion or contraction, and exercise no injurious influence on the mouth by the formation of soluble salts.

Q. What is the discoloration of amalgam largely due to.

A. To the formation of sulphides, owing to presence of sulphur in fluids of mouth.

Q. What is the influence of Tin on amalgam.

A. It facilitates amalgamation, and gives plasticity.

Q. What is the influence of Silver on amalgam,

A. It facilitates amalgamation and setting, gives sharpness of edge, rapid hardening, and lessens tendency to assume spheroidal form.

Q. What is the influence of Gold.

A. Sharpness of edge and rapid hardening.

Q. What is the influence of Platinum.

A. Greater hardness, and more rapid setting.

Q. What is the influence of Copper.

A. Controls shrinkage but increases tendency to discoloration; it is also supposed by some to exert a preservative influence on tooth structure.

Q. The tendency of some or many amalgams to assume a globular form, has what effect upon tooth.

A. It leaves edges of cavity unprotected.

Q. Do some amalgams (as one with an excess of silver, or of mercury and silver) ever unduly expand.

A. Yes, sometimes enough to split tooth, or reach one fortieth of the diameter of filling.

Q. What cause has Mr. Fletcher assigned for expansion.

A. That it occurs only in amalgams that shrink, the filling being raised, or forced out, by decomposition of tooth-substance and formation of gas under loosened filling; the forcing in and accumulation of food under filling, etc.

Q. To what may failure of an amalgam filling sometimes be attributed.

A. Not only to shrinkage, but to the action of sulphur on the silver of an amalgam.

Q. What is the presence of sulphur in mouth due to.

A. Uncleanliness resulting in decomposition of particles of food about teeth, which contaminates oral fluids, the sulphur being in combination with hydrogen as hydric-sulphide (H_2 S).

Q. What will keep bright almost any amalgam filling.

A. Attrition, either by mastication or use of tooth brush.

Q. Does every amalgam filling that retains its brightness protect the tooth.

A. No, but conversely one that is greatly discolored may protect the tooth.

Q. What should the basal proportions of a good dental amalgam consist of.

A. Sixty silver, forty tin, modified by additions of gold and zinc; some add copper, or antimony, or platinum, to this list.

Q. What does nearly every amalgam now made contain.

A. Fifty per cent of tin, and more than forty of silver, while remaining per cent—2 to 7 are gold and platinum.

Q. What is Prof. James H. Harris' formula.

A. To every one hundred grains of silver and tin add two per cent of gold and platinum, and from two to four per cent of zinc.

Q. What is the composition of Arrington's Amalgam.

A. Tin 57.5, silver 42.5.

Q. What of Blackwood's

A. Tin 56.85, silver 42, gold 0.50, platinum 15, zinc 0.50.

Q. What of Dawson's white alloy.

A. Tin 49.27, silver 48.24, gold 0.05, zinc 2.44, with a trace of palladium.

Q. What of Dibble's.

A. Tin 49.65, silver 49.75, gold 0.20, zinc 0.40.

Q. What of Flagg's Contour.

A. Tin 37, silver 58, gold 5.

Q. What of Globe.

A. Tin 53.36, silver 44.74, gold 1.50, platinum 0.40.

Q. What of Hardman's.

A. Tin 44.57, silver 50.12, copper 5.31.

Q. What of Johnson and Lund's Extra.

A. Tin 61.55, silver 36.75, gold 0.15, platinum 0.50, cadmium 1.45.

Q. What of Justi's.

A. Tin 59.10, silver 35.20, gold 0.32, platinum 0.08, copper 3.50, zinc 1.80.

Q. What of King's occidental.

A. Tin 54.75, silver 42.75, zinc 2.50.

Q. What of Lawrence's (new).

A. Tin 50.43, silver 44.06, copper 5.51.

Q. What of Standard.

A. Tin 55.40, silver 44.60.

Q, What of Townsend's (improved).

A. Tin 54.50; silver 44.50, gold 1.

Q. What of Welch's (new).

A. Tin 51.90, silver 46.00, gold 1.70, platinum 0.40.

Q. What of Dr. Ambler Tees.

A. Tin 40 dwts, silver 24 dwts, gold 1 dwt, platinum 1 dwt.

Q. How should dental amalgams be prepared.

A. Gold, silver, and platinum to be melted first with borax, and kept fused for five minutes; tin melted in a separate crucible, and the molten gold, silver, and platinum poured into the fused tin, and the mass quickly poured into an ingot-mould and reduced to fillings.

Q. What is the action of mercury in dental amalgam.

A. As soon as incorporated, its molecules begin to act on the silver particles, chemically combining with them to form a hard filling.

Q. What is the effect of too much tin.

A. The molecules of silver will be so far apart, or meet in such small quantities, that the mass is very plastic and wants hardness; hence tin is but the medium or vehicle in which the silver molecules are interspersed for amalgam purposes.

Q. Is there a great difference of opinion in regard to the effect of gold on a dental amalgam.

A. Yes, while some contend that it diminishes shrinkage, increases rapidity of setting, imparts fine-grained plasticity, and edge strength, and controls maintenance of color, others think that it reduces color standard, and has no effect on shrinkage or expansion; still others consider its presence of no use, and rather an injury.

Q. Is there a difference of opinion in regard to the quantity of zinc.

A. Yes, while some think but four per cent. will facilitate setting, control shrinkage and prevent discoloration; others contend that quantities over two per cent. will not accomplish such results.

Q. When is platinum thought to be of service in an amalgam.

A. Only when it is combined with tin and silver and proper quantity of mercury, does it confer quick-setting, and great hardness; but all alloys containing platinum amalgamate less readily than those in which it is absent.

Q. What objections have been urged against platinum.

A. That it is of no use in dental amalgams because it renders them more brittle and liable to crumble in proportion to quantity used.

Q. What is claimed for copper in dental amalgams by Flagg, Miller, and others.

A. That it has a marked compatibility with tooth-bone, and that dental pulps show a decided toleration for amalgams containing copper; that they exert marked anti-bacterial influences upon walls of cavities, and have same effect as if antiseptics were incorporated.

Q. What is the usual quantity of copper incorporated in a dental amalgam.

A. About five per cent; ranging from one to ten per cent.

Q. Why does copper discolor an amalgam.

A. Owing to its ready affinity for the sulphur of sulphuretted hydrogen gas, and with the silver forms black sulphide of silver.

Q. What is Copper Amalgam.

A. Pure copper and mercury only; must not be confounded with amalgams containing copper, silver, tin, and other metals.

Q. How is Copper Amalgam prepared.

A. Pure copper is obtained by precipitating copper from its solution by electricity in the form of impalpable powder, the amalgamation being accomplished by trituration with pestle in a mortar; the surplus mercury is squeezed

out through chamois skin, repeating the heating, squeezing, and triturating until crystallization occurs and the required density is obtained.

Q. How is it prepared for filling cavities.

A. Softened by heat, and triturated to render it plastic, until a smooth, gray mass is made.

Q. Why is Antimony sometimes used in dental amalgams.

A. To control shrinkage and give fine-grained plasticity.

Q. What are the objections to its use.

A. It causes discoloration and makes a dirty amalgam.

Q. Why is Palladium used in an amalgam.

A. To control shrinkage and render it quick-setting.

Q. What are the objections to its use.

A. It imparts brittleness and discoloration, and difficult manipulation.

Q. Why was Cadmium used in amalgam.

A. To retain color, and give rapid setting.

Q. What objections to its use.

A. Injury to tooth-structure and pulp.

Q. Is mercury a cause of discoloration of amalgam.

A. No, mercury retards the black discoloration.

Q. What quality of mercury should be used.

A. Very pure, and free from tin, lead, zinc or bismuth.

Q. What is the process of rectifying mercury by nitric acid.

A. Digest one or two pounds of mercury in dilute nitric acid (1 f. ℥. to 8 of water) for three or four hours in a glass bottle at temperature of 130° to 140° F, shake bottle every half hour, then pour off the diluted acid and its impurities, and wash mercury in water.

Q. What appliances are used in dental laboratory for melting metals.

A. Safety-lamp with mouth or automatic blow-pipe, Burgess, Knapp's, Fletcher's and other blow-pipes and melting furnaces.

Q. What are crucibles in which metals are melted composed of.

A. Clay mixed with silica, burnt clay, graphite or other infusible material; and for melting platinum of lime.

Q. Before using a Hessian crucible how should it be prepared.

A. Powdered borax should be rubbed on inside to glaze surface, facilitate pouring and prevent loss of metal by adhering to sides.

Q. What are Ingot-molds for reception of molten metal made of.

A. Cast iron, soapstone, charcoal; and of lime for platinum.

Q. How should Ingot-mold be prepared for the metal.

A. Heated and oiled.

Q. How is rolling Ingot into Plate accomplished.

A. By passing it between cylindrical steel rollers, gradually brought together by screws, the metal being frequently annealed.

Q. How is wire made.

A. By a draw-plate, through the holes of which the metal of a cylindrical shape is drawn.

Q. What is meant by soldering.

A. The union of pieces of metal by the fusion of an alloy that is called solder, and which melts at a lower temperature than the pieces of metal to be united.

Q. What are the requisits for successful soldering.

A. Contact of the pieces of metal to be joined together; a metallic surface free from oxidation, and other impurities over which the solder is to flow; a fusible, free flowing solder; proper degree of and distribution of heat; and in the case of artificial dentures, complete drying and heating up of investment.

Q. What will prevent or remove oxidation and give bright clean surfaces in soldering.

A. Borax employed as a flux, by dissolving the oxide and protecting surface from further oxidation by excluding air; also a weak solution of sulphuric acid and water.

Q. What should be the requisites of a dental solder.

A. Free flowing, correspond in color as nearly as possible to metals to be united, and of as high a grade as is possible, to resist action of fluids of mouth.

Q. How should the heat be managed in soldering.

A. Raised gradually to prevent displacement of pieces of solder, or the fracture of teeth; both teeth and plate brought to same temperature; equal distribution of heat until parts are heated nearly to fusing point of solder, when a pointed blue flame is directly brought to bear on the solder.

Q. What are Solder-supports made of.

A. Well-burned charcoal of light woods, pumice stone, graphite or plumbago, coke, asbestos and plaster, charcoal and plaster, etc., or the sheet-iron funnel-shaped hand furnace filled with ignited charcoal, which serves to heat up case, as well as for a support.

ZINC.

Q. What is the Symbol of Zinc.

A. Zn.

Q. What is the Atomic Weight.

A. 65.2.

Q. Is metallic zinc ever met with in nature.

A. No.

Q. What are the principal ores of zinc.

A. Red oxide—Sulphide (blende), native carbonate (calamine).

Q. What is the most valuable.

A. Carbonate, and from it metallic zinc is extracted.

Q. How is metallic zinc obtained from the carbonate.

A. First roasted or calcined to expel water and part of the carbonic acid, and make it friable, then reduced to powder, and mixed with coal dust and distilled at a red heat; carbon monoxide escapes, while the reduced metal volatilizes and is condensed.

Q. What is the nature of zinc.

A. Brittle, crystalline, of a bluish-white color, and recent fracture shows a brilliant crystalline surface.

Q. What is its density.

A. 6, 8 to 7, 2.

Q. Between what degrees of temperature does it become quite malleable and ductile.

A. 248° to 302° F.

Q. What is remarkable about its malleability.

A. It retains it when cold.

Q. What is the effect of heating to 410° F.

A. It is so brittle that it may be powdered in a mortar.

Q. What is the fusing point of zinc.

A. Below red heat—773° F.

Q. What is the effect of a bright-red heat.

A. Boils, volatilizes, and in air burns with a whitish-blue light generating oxide of zinc.

Q. How is chloride of zinc prepared.

A. Dissolving zinc in hydrochloric acid.

Q. What do the oxide and chloride form the chief ingredients of

A. Oxychloride of zinc filling material.

Q. What the oxide and glacial phosphoric acid.

A. Oxyphosphate of zinc filling material.

Q. What other minerals in the oxychloride.

A. Borax and silex.

Q. What other minerals in the oxyphosphate.

A. Borax, silex, and ground glass.

Q. How much zinc is usually found in dental amalgams.

A. Two to four per cent.

Q. What is the effect of melting zinc and lead together.

A. Lead goes to bottom as the heavier, both being alloyed, the zinc with one to two per cent of lead, and the lead with one to six of zinc.

Q. Does zinc unite with tin.

A. Yes, in all proportions.

Q. Are dies for swaging plates ever made of zinc and tin.

A. Yes, zinc four parts, tin one part, for sharpness; also zinc two parts, tin one part (Fletcher).

Q. What is zinc alloyed with to form Brass.

A. With copper—28 to 33 zinc; 67 to 72 copper.

Q. Does zinc expand greatly when heated.

A. Yes, and contracts on cooling.

Q. Is a zinc die very brittle and easily trimmed when hot.

A. Yes; a hot zinc die may fracture in falling on hard surface.

Q. Will zinc affect melting ladle.

A. Yes, may penetrate it; but may be prevented by coating inside with whiting.

LEAD.

Q. What is the Symbol of Lead.

A. Pb. (Plumbum).

Q. What is the Atomic Weight.

A. 207.

Q. What is the source of Metallic Lead.

A. Native sulphide or galena.

Q. What is the nature of lead.

A. Soft, bluish, little tenacity, very malleable and ductile.

Q. What is the fusing point of Lead.

A. 617° F.

Q. What is effect of white heat on lead.

A. Boils and volatilizes.

Q. What is the effect of dilute acids on lead.

A. Slow action.

Q. Does lead readily unite with tin.

A. Yes, in all proportions.

Q. Does lead unite readily with mercury.

A. Yes, condensation results from the union.

Q. What is the effect of alloying lead with much silver.

A. It will remain fluid at a lower temperature; separation of ores of lead and silver are thus effected.

Q. What is the effect of lead on gold.

A. The one nineteen hundred and twentieth part of lead will impair ductility of gold.

Q. Have lead and platinum great affinity.

A. Yes, and the alloy usually can be fused at a low temperature.

Q. What are the most valuable alloys of lead.

A. Those it forms with tin, antimony, and bismuth.

Q. What is Type Metal.

A. Lead 80, antimony 20.

Q. What are the dental uses of lead.

A. For counter-dies and an ingredient of fusible metals.

Q. What alloys of lead are used for counter-dies.

A. Lead 8, antimony 1; lead 1, tin 2.

Q. What compose some of the Fusible Metals.

A. Lead 1, tin 1, bismuth 1—fuses at 250° F.
Lead 5, tin 3, bismuth 8— " 200° F.
Lead 2, tin 1, bismuth 3— " 200° F.

Q. What is Wood's metal, for repairing vulcanite sets, composed of.

A. Lead 6; bismuth 7, cadmium 1; fuses at 180° F.

TIN.

Q. What is the symbol of Tin.

A. Sn (Stannum).

Q. What is the Atomic Weight.

A. 118.

Q. In what form is it found.

A. Chiefly as an oxide.

Q. How is metallic tin obtained.

A. Ore is first stamped, then roasted to free it from sulphur and arsenic, then subjected to high temperature with charcoal which sets free the metal.

Q. What is its nature.

A. Soft, malleable, brilliant white, faint lead tint when compared with silver.

Q. What is the Fusing Point of Tin.

A. 442° F. or 458.6° F. according to some, with a density of 7.3.

Q. What is cause of peculiar crackling sound a bar of tin emits when it is bent.

A. By sliding of crystalline plates over each other; it is called "the cry of tin."

Q. When heated much above its fusing point.

A. It oxidizes freely, and is converted into oxide of tin, or "polishing putty," in form of a yellowish-white powder.

Q. What is effect of nitric acid on tin.

A. Converts into hydrated dioxide, a white, insoluble powder.
Q. What is effect of hydrochloric acid.
A. When aided by heat, forms stannous chloride.
Q. What is the effect of nitro-hydrochloric acid.
A. Forms stannic chloride.
Q. Does Tin alloy with many metals.
A. Yes and renders them more brittle.
Q. What is Dr. G. F. Reese's base for artificial dentures.
A. Tin 20, silver 2, gold 1,
Q. What is Cheoplastic metal.
A. Tin, silver, bismuth, antimony, and cadmium.
Q. What is Fletcher's Platinum and Gold Amalgam.
A. Tin 50.35, silver 43.35, gold 3.35, platinum 1.30, copper 1.65.
Q. What is Dr. Bean's base for lower sets.
A. Tin alloyed with a small per centage of silver.
Q. What is Bell-metal.
A. Tin 2, copper 78.
Q. What is common Babbitt metal.
A. Tin 12, antimony 3, copper 2.
Q. What is Bronze.
A. Alloy of tin and copper, and sometimes zinc.
Q. How may pure tin be obtained.
A. By dissolving commercial tin in hydrochloric acid; filter, evaporate solution to small bulk, treat with nitric acid, wash thoroughly, expose to red heat in crucible with charcoal, and pure tin in form of button is found at bottom of crucible.
Q. What are the impurities of commercial tin.
A. Arsenic, lead, iron, copper antimony, bismuth.
Q. What is the object of using tin and gold foils combined, against cervical walls of cavities.
A. Galvanic action is confined to the two metals, and tooth-structure is protected.
Q. Has tin any affinity for cast iron.
A. No, but adheres to surface of wrought iron, if cast iron is decarbonized it will adhere to it.
Q. What is Mosaic Gold.
A. White oxide of tin combined with sulphur.

GOLD.

Q. What is the Symbol of Gold.
A. Au.—Aurum.
Q. What is its Atomic Weight.
A. 197.
Q. How early was gold used in dentistry.
A. 300 B. C., by the Romans to secure artificial teeth in mouth.
Q. What is the native rock or bed of gold.
A. Quartz.
Q. Is gold always found in metallic state.
A. Yes, it is rarely found in crystals; form of octahedrons.
Q. What is the invariable alloy of native gold.

A. Silver; California gold 10 per cent, Australian 5 per cent.

Q. What other metals are often found with gold.

A. Iron, copper, platinum, iridum, palladium, rhodium, tellurium.

Q. What is the effect when iridium exists in gold.

A. The small and very hard fine grains injure rolling mill.

Q. What glittering particles are often mistaken for gold.

A. Iron and copper pyrites and yellow mica.

Q. What are the tests for such minerals.

A. For iron pyrites—magnet attracts them, very brittle, one quarter as heavy, and nitric acid acts violently on them; for copper pyrites—they lose metallic lustre under blowpipe, and fuse into black globules; and if carbonate of soda and borax are added, a button of copper is obtained; for yellow mica—its specific gravity is only three, of gold nineteen, and microscope shows it to be without metallic lustre and dark-gray in color.

Q. What ore is invariably gold-bearing.

A. Lead.

Q. Has a native gold amalgam ever been found.

A. Yes, in California.

Q. What other metals sometimes contain gold.

A. Arsenic, antimony and platinum.

Q. What is color and softness of pure gold.

A. Rich yellow, nearly as soft as lead.

Q. What properties distinguish gold.

A. Extreme malleability, ductility, and tenacity; most malleable of all metals; one grain may be beaten into leaves covering fifty-six square inches, and one three hundred thousandth of an inch thick.

Q. How many times heavier than water.

A. 19½.

Q. Is it a very tenacious metal.

A. No, but if covered by silver, one grain may be drawn into a wire five hundred feet long.

Q. What is the Fusing Point of gold.

A. 2016° F.

Q. Is it capable of being welded while cold.

A. Yes.

Q. How can gold be volatilized.

A. Only by passing a powerful charge of electricity through a thin leaf.

Q. How is gold obtained from quartz rock.

A. By stamping and amalgamation.

Q. By what other process is gold sometimes reduced from the ore.

A. Exposing roasted ore to chlorine gas, which converts it into a soluble chloride, which is removed by washing, and the gold precipitated by sulphate of iron.

Q. What will dissolve gold.

A. Aqua Regia—hydrochloric acid two parts, nitric acid one part.

Q. How may gold be refined.

A. By concentrated hot sulphuric acid converting the silver and copper into soluble sulphates, without action on gold; also by nitric acid, but latter does not yield as fine gold.

Q. What is an accurate method of separating silver from gold.

A. Refining by chlorine gas.

Q. What will precipitate gold in solution.

A. Oxalic acid, sulphurous acid, and sulphate of iron.

Q. How may brittle gold be treated.

A. Exposing it in a fused state to a stream of chlorine gas, which converts contaminating substances into volatile chlorides.

Q. What will also restore the toughness of gold.

A. By throwing a little corrosive sublimate on surface of molten metal.

Q. How may scrap gold of dental laboratory be refined.

A. By melting it with mixture of nitrate of potash and borax; or ten per cent. of black oxide of copper.

Q. How may iridium be separated from gold.

A. By melting gold with three times its weight of silver and granulating it; then treat alloy with nitric acid to dissolve the silver, and then add aqua regia to act upon gold, and precipitate gold from solution by oxalic or sulphurous acid.

Q. How may Laboratory gold scrap be freed of iron, lead, tin and copper.

A. Boil scrap in form of filings in pure nitric or hydrochloric acid, then wash in water, and melt, using carbonate of potash, or borax as a flux.

Q. How refine gold scrap containing solder and platinum.

A. Melt for one-half to one hour, adding nitrate of potash and borax frequently, stirring with rod; cool, break crucible and separate gold from dross with hammer, melt gold again and pour into ingot mould, roll or hammer ingot into thin ribbon, and dissolve in aqua regia, evaporate solution to dryness and again melt.

Q. From what form of gold is plate of artificial denture made.

A. From gold coin.

Q. What is fineness of gold coin.

A. Am. coin—21.6; English—22.

Q. What of pure gold.

A. 24.

Q. From what form of gold should solder be made.

A. Pure gold, so as to determine its carat or fineness.

Q. Give formulæ for Gold Plate from pure gold.

A. 18 carat plate—pure gold 18 dwts; pure copper 4 dwts; pure silver 2 dwts. 20 carat plate—pure gold 20 dwts; pure copper 2 dwts. pure silver 2 dwts.

Q. Give formulæ for gold plate from coin.

A. 18 carat plate—gold coin 20 dwts; pure copper 2 dwts; pure silver 2 dwts. 20 carat plate—gold coin 20 dwts; pure copper 18 grs.; pure silver 20 + grs. 21 carat plate—gold coin 20 dwts; pure silver 13 + grs.

Q. Formula for 21 carat plate.

A. Gold coin 20 dwts; pure copper 6 grs; pure platinum 7 5-7 grains; or 10 grs. of platinum to 20 dwts of gold coin.

Q. Give formula for gold solders.

A. 14 carat solder—Am. gold coin $10; pure silver 4 dwts; pure copper 2 dwts. 18 carat gold solder—gold coin 30 parts; pure silver 4 parts; pure copper 1 part; brass 1 part. 20 carat solder for crown-and-bridge-work—Am. gold coin $10. (258 grs.); spelter solder (equal parts of copper and zinc) 20.64 grs.

Q. What is a formula for gold clasps.

A. Coin gold 20 dwts; pure silver 10 grs; pure copper 8 grs; platinum 20 grs.

Q. How may an easy flowing solder be made of a $1 gold coin.

A. By adding to it silver 8 grs., copper 5 grs., zinc 5 grs.

Q. How ascertain carat of any given alloy.

A. Multiply 2 by weight of gold in alloyed mass, and divide product by weight of mass, the quotient is the carat sought.

Q. How reduce gold to a required carat.

A. Multiply weight of gold used by 24. and divide the product by required carat; the quotient is the weight of mass when reduced, from which subtract weight of gold used, and remainder is weight of alloy to be added.

Q. How raise gold from lower to higher carat.

A. Multiply weight of alloyed gold used, by number representing proportion of alloy in given carat; divide product by figures representing quantity of alloy in required carat; quotient is weight of mass when reduced to required carat by adding fine gold.

Q. Does alloying gold with silver affect its malleability.

A. No, but increases its hardness; same with pure copper.

Q. What effect has equal weight of platinum on gold.

A. Alloy of good malleability, but dullness of color.

Q. What is nature of alloy of gold and tin.

A. Hard and brittle.

Q. How does gold combine with mercury.

A. At all temperatures; union facilitated by heating.

Q. How with silver.

A. In all proportions.

Q. How with zinc.

A. Have strong affinity but brittle.

Q. What is Purple of Cassius.

A. Gold, tin and oxygen; gives gum color to artificial teeth.

Q. What quality of gold is used for filling teeth.

A. Nearly pure.

Q. What two varieties of gold foil.

A. Cohesive and non-cohesive.

Q. How is quality of non-cohesiveness obtained.

A. Either by alloying, or by depositing carbon on surface, or by some mechanical process during lamination.

Q. Does union take place between particles of non-cohesive gold introduced into a cavity.

A. No, they are made to adhere mechanically by wedging one piece against another.

Q. How is it with cohesive gold.

A. Union or welding occurs whenever two pieces are brought in contact.

Q. What does a comparison between cohesive and non-cohesive sheets of gold show.

A. Cohesive of closer texture, and more disposition to separation of particles of non-cohesive.

Q. What is the important property of cohesive as a filling material.

A. Welding by pressure after recent annealing to a dull red heat.

Q. What impairs cohesive property of gold.

A. Exposure to air, moisture, certain gases, exhalations of skin, etc.

Q. What will restore gold impaired by many such causes.

A. Annealing.

Q. What gases are particularly injurious to cohesive property of gold.

A. Sulphurous acid gas from matches, and decay of animal and vegetable matter; sulphuretted hydrogen from same cause, such as blood left in spittoon; carbonic acid gas; chlorine gas.

Q. Does annealing gold harden or soften it.

A. Softens it.

Q. What form of gold is more readily affected by deleterious agents.

A. Cohesive.

Q. For grinding surface and other simple cavities the use of what form of gold is a saving of time.

A. Non-cohesive.

Q. What is the best method of annealing gold foil.

A. On a sheet of mica over an alcohol flame; not by passing pieces through the flame.

Q. How is corrugated gold prepared.

A. By placing sheets of foil between leaves of unsized paper, and tightly packing in iron boxes, which are exposed to a temperature high enough to carbonize the paper, making gold soft and non-cohesive.

SILVER.

Q. What is the Symbol of Silver.

A. Ag (Argentum).

Q. What is its atomic weight.

A. 108.

Q. What are the most common ores of silver.

A. Those resulting from combination with sulpnur as sulphides.

Q. In what form is silver found.

A. As native silver, occasionally in flat masses, sometimes crystalline.

Q. What does it contain traces of.

A. Gold, antimony, etc., but free from any considerable admixture; also as chloride, bromide and iodide.

Q. What is chloride of silver.

A. Native horn—silver—silver, 75.3, chlorine, 24.7.

Q. With what metals is silver associated in this country.

A. Copper, also with lead ore—galena, and antimony.

Q. How is metallic silver obtained from the ore.

A. By uniting it with lead and separating by cupillation; by converting it into a chloride and reducing by iron and sulphuric acid; by amalgamation.

Q. How is native silver usually separated from its accompanying rock.

A. By stamping to powder and amalgamating.

Q. What is the nature of the Colorado and Idaho Silver ores.

A. Silver 60 parts, antimony 20, sulphur 14, oxygen 10.

Q. What are the properties of silver.

A. A brilliant whiteness, hardness between gold and copper, very ductile and malleable, in weight as much so as gold, in tenacity it exceeds gold; best conductor of heat.

Q. What is the Specific Gravity of Silver.

A. 10.53.

Q. What is the fusing point of silver.

A. 1873° F.

Q. Describe process of obtaining Pure Silver.

A. Dissolve metal in pure nitric acid slightly diluted with water, assisted by a moderate heat; precipitate with a solution of common salt; pour off solution, wash chloride; place it in water acidulated with hydrochloric acid; then add pieces of clean iron, when an evolution of hydrogen takes place, liberating the silver in a spongy mass, which is washed and melted; gives silver of 999.7 fineness, the 0.3 impurity being iron.

Q. How obtain pure silver from coin.

A. For 1oz: dissolve 520 grains of coin silver in 1oz. of pure nitric acid diluted with ¼ water, and apply heat until all is dissolved; dilute solution with 2 or 3 times its bulk of rain-water, into which put a strip of bright copper; wash and melt the precipitated silver.

Q. How may pure silver be obtained from chloride of silver.

A. By fusing with carbonate of soda.

Q. How may pure silver be obtained from Nitrate of Silver.

A. By dipping a sheet of copper in a solution of the nitrate; 1½ ounces of nitrate will contain rather more than 1oz. of pure silver.

Q. How is Granulated Silver obtained.

A. By pouring pure silver from a height of several feet into water.

Q. How is nitrate of Silver (Lunar Caustic) prepared.

A. By dissolving silver in nitric acid with a gentle heat.

Q. What is effect of alloying silver with copper.

A. Adds greatly to the hardness; maximum hardness from 1 part of copper to five parts of silver.

Q. What will give a durable plate for dentures

A. 3 to 10 grains of platinum to each pennyweight of silver.

Q. Give formula for Silver solders.

A. For good solder; pure silver 6 parts, copper 3, zinc 1; or pure silver 5½ dwts., brass wire 40 grains. Easy flowing—Pure silver 20 parts, copper 3, brass 5.

Q. Describe process of making Silver Solder.

A. Put silver in crucible and cover with powdered borax, and melt thoroughly; then add copper and brass, hold crucible with tongs, and mix by shaking; pour into ingot mould, and roll to thickness No. 27.

Q. How give a frosted surface to Silver.

A. Heat nearly to redness, plunge into water acidulated with nitric or sulphuric acid.

Q. Give standard fineness of Am. and French coin.

A. 90 parts pure silver, 10 parts pure copper.

Q. English Coin.

A. 111 parts silver, 9 parts copper.

Q. How may silver be deposited on another metal.

A. By connecting the article with zinc negative pole of a galvanic battery, and immersing in solution made by dissolving cyanide of silver in a solution of cyanide of potassium.

MERCURY.

Q. What is the Symbol of Mercury.

A. Hg (Hydrargyrum). Quicksilver.

Q. What is the Atomic Weight.

A. 200.

Q. At what temperature does it become solid, or fuse.

A. At 39° F. only metal liquid at ordinary temperatures, below 39° it may be hammered and welded.

Q. At what temperature does it volatilize readily.

A. At 600° F. and somewhat at ordinary temperatures.

Q. What are its properties.

A. Silver—white color, high lustre; boils at 660° F. very soluble in strong nitric acid; is dissolved in sulphuric acid only by heat; hydrochloric acid has no effect on it.

Q. Where is it found of singular purity.

A. California and Australia.

Q. What are its sources.

A. Cinnabar, or mercuric sulphide—the ore from which the metal is obtained, also horn quicksilver, native amalgam of silver and mercury.

Q. How is it obtained from the sulphide.

A. Sulphide is heated in iron retort, or roasted in furnace, and mercury is condensed from the vapor.

Q. How is it adulterated.

A. With tin and lead.

Q. How detect presence of such metals.

A. By scattering a little on clean glass plate, when it "tails" or leaves a track; or by foul surface when shaken in a bottle containing air.

Q. How may lead be removed.

A. By nitric acid diluted with two parts of water, which should cover its surface for several days, with occasional stirring.

Q. How is it distilled and re-distilled to make it pure.

A. Place it in a glass or iron retort and add to its surface clean iron filings or coarse powdered cinnabar and heat on sand bath; if cinnabar is used, its sulphur converts foreign metals into sulphides, and the pure mercury is set free.

Q. What is a simple method of redistilling it.

A. Place mercury in a bottle and add fine ground loaf sugar, shake thoroughly, open bottle and blow in air by a bellows, repeat several times, and filter through pin holes of paper cone, the oxides of foreign metals adhere to the sugar; pure mercury can also be obtained by decomposing pure vermilion, red oxide, or corrosive sublimate, by heat.

Q. How may pure mercury be obtained for dental amalgams.

A. By putting the impure mercury in a little mercurous nitrate dissolved in water which decomposes the salt, and oxidizes the metals; also by digesting in a solution of nitric acid one part and water eight parts for several hours at temperature of 130° F.

Q. With what metals does mercury amalgamate readily.

A. Gold, silver, tin, lead, zinc, bismuth, potassium, and cadmium; with potassium with violence; not so readily with platinum, copper and palladium.

Q. What is Vermilion.

A. Mercuric sulphide (Hg S); used to color vulcanite and celluloid.

Q. How is it obtained.

A. By stirring mixture of one part of sulphur with seven parts of mercury

in an iron pot, chemical union takes place, and result is a black powder, and small quantities are put in subliming pots and heated to redness for 36 hours, levigated and dried.

Q. What is nature of pure vermilion.

A. Inert and harmless.

Q. What may it be adulterated with.

A. Red lead, disulphide of arsenic, ferric oxide, brick dust.

Q. What effect have acids and alkalies upon it.

A. No effect

Q. What will convert it into corrosive sublimate.

A. Aqua regia.

Q. What do the best amalgams contain.

A. Tin, silver, gold, platinum and zinc.

Q. How are dental amalgams made.

A. By melting platinum, gold and silver first, and surface of molten alloy covered with charcoal; then add the tin, and stir with a porcelain rod, and pour into ingot mould; ingot cut or filed into shavings or filings.

PLATINUM.

Q. What is the Symbol of Platinum.

A. Pt.

Q. What is the Atomic Weight.

A. 197.6.

Q. What is source of largest supply.

A. Ural Mountains of Russia; it is not an abundant metal.

Q. How is the ore treated to obtain the metal.

A. Heated with nitric and hydrochloric acids to dissolve foreign metals present, then with diluted nitro-hydrochloric acid to prevent iridium from being dissolved, then with ammonic chloride to precipitate yellow crystalline ammonio-platinic chloride, which is decomposed by heat, giving platinum in finely divided state, which is subjected to great pressure, and column of platinum heated by charcoal to dry and cleanse it, again heated and hammered on ends to weld particles; and traces of iron removed by coating it with mixture of borax and carbonate of potash when it is again heated to white heat, and spongy mass forged into a solid mass.

Q. What property has it similar to iron.

A. Like iron capable of being hammered while red hot, and welded under intense heat; gold welds cold, silver not at all.

Q. At what temperature does it fuse.

A. 3999° F. by oxyhydrogen blow-pipe; with six or eight jets to melt masses.

Q. What is specific gravity.

A. 21.5; heaviest metal.

Q. What are the properties of platinum.

A. Pure is very malleable, exceeds in tenacity all metals except copper, in ductility ranks next to silver, whiter that iron, softer than gold or silver, harder than copper; no single acid will affect it, nor air, nor moisture at any temperature, fusible metals readily alloy with it, and their oxides act on it, aqua regia dissolves it more slowly than gold, alkaline carbonates have no effect on it, but caustic alkalies attack it at red heat; resists oxidation as well

as pure gold, expands less under heat than any other metal, and is thus suitable for pins of teeth.

Q. What will destroy its malleability.

A. Heated in contact with arsenic, phosphorous, and silica.

Q. What are its chief uses in dentistry.

A. Pins for artificial teeth, base for continuous gum work. (if pins expanded much, teeth would be cracked; and if plate did so, the gum and body would crack.)

Q. What is proper solder for platinum.

A. Pure gold.

Q. What two states of fine division does platinum exhibit.

A. Spongy platinum, and platinum-black, either of which can be used to give grayish tint to porcelain.

Q. What is nature of Platinum Alloys.

A. Unite with gold in all proportions; equal parts of platinum and gold make a malleable alloy; one part to eleven of gold is grayish-white, elastic, and answers for irregularity appliances; two parts to one of gold, is a brittle alloy; silver and platinum, is less white but harder than silver and less malleable, one thousandth part of platinum hardens steel and iron, and one per cent. will prevent ordinary nitric acid from acting on iron; antimony, bismuth, tin, lead and zinc readily unite with platinum when it is heated to redness; arsenic forms with it a brittle alloy, fusible, and has been used as a solder.

PALLADIUM.

Q. What is Symbol of Palladium.

A. Pd.

Q. What is the Atomic Weight.

A. 106.5.

Q. To what group does it belong.

A. Same as iridium, rhodium, osmium, ruthenium and davyum.

Q. What is its Source.

A. Occasionally found native, but chiefly obtained from crude platinum after precipitation by ammonic chloride, when it is neutralized by carbonate of soda, and mixed with sol. of cyanide of mercury, palladium cyanide resulting, which when washed, dried, and melted gives metallic palladium.

Q. What are the properties of palladium.

A. When reduced to metal, it is a spongy mass, which may be welded into a solid mass like platinum; appears like an alloy of gold and platinum where latter is in excess; slightly darker than platinum, malleable, and ductile, but its density is only 11.8; like platinum in hardness, and the two alloyed are harder than either.

Q. What is its fusing point.

A. 2786° F. same as cast iron.

Q. What are its dental uses.

A. For plates, and amalgam; for plates either pure or alloyed with silver, but is not better than gold and platinum.

Q. What are its properties as an amalgam.

A. Added to gold, silver and tin, it blackens alloy, but not the tooth, and has same effect as platinum; sets rapidly, and mixed in large quantity, it evolves heat, and explodes with emission of light; should be used in small

pellets and introduced rapidly; unites readily with mercury when in fine powder, there being a chemical affinity between them; unites with silver in all proportions, giving a very brilliant surface; as it cools it hardens and expands; very expensive.

IRIDIUM.

Q. What is Symbol of Iridium.

A. Ir.

Q. What is the Atomic Weight.

A. 198.

Q. What is its source.

A. Several forms of platinum ore or crude platinum; associated with California gold in hard small grains; also found in scales.

Q. What will liberate iridium.

A. Dissolving crude platinum in aqua regia, in form of gray, metallic scales, which resist action of acid.

Q. What is the most interesting form.

A. Native alloy of iridium and osmium-osmo-iridium.

Q. What are its properties.

A. Very hard and brittle, nearly white, and only fusible under oxyhydrogen blow-pipe, when it is like polished steel, same density as platinum, and at white heat may be compressed into compact masses, and only again dissolved by igniting it with a mixture of chlorate of potassium and sodium in a current of chlorine.

Q. What are its dental uses.

A. Alloyed with platinum for posts of crowns, and backings of teeth for greater strength; also for plates, but is hard to swage, requiring die and counter-die of zinc; also for clasps.

Q. What is the best solder for it.

A. Pure gold.

Q. What is its fusing point.

A. 3999°, same as platinum.

ALUMINUM—ALUMINIUM.

Q. What is Symbol of Aluminium.

A. Al.

Q. What is its Atomic Weight.

A. 27.4.

Q. What is its source.

A. Main constituent of earth alumina, the oxide of the metal aluminium, and is in greatest profusion in whole composition of the globe; no other metal is so abundant.

Q. What does its combination with oxygen and silicum form.

A. Essential part of granite.

Q. How is it obtained.

A. By heating to redness a mixture of double chloride (or fluoride) of aluminum and sodium (cryolite) with metal sodium, by which chloride of sodium is formed and metal aluminum separated; it may be separated by electrolysis.

Q. What are its properties.

A. Extreme lightness, color of new zinc, very malleable and ductile, may be

rolled into thin sheets or drawn into fine wire, very sonorous, conducts heat and electricity same as silver; does not oxidize in air.

Q. What is its specific gravity.

A. 2.56; only 2½ times heavier than water, 4 times lighter than silver.

Q. What effects have acids upon it.

A. Strong nitric acid does not affect it, insoluble in dilute sulphuric, but is readily dissolved in dilute or strong hydrochloric acid; also in solutions of caustic potash or soda.

Q. What is nature of its alloys.

A. It forms alloys with nearly all metals; with copper it resembles gold; with tin and zinc a brittle alloy, with silver a hard alloy, but it does not amalgamate with mercury, although an aluminum dental amalgam is sold; it forms the base of all the silicates; the only oxide is alumina $Al_2 O_3$.

Q, What is its fusing point.

A. 1000° F.

Q. What are the dental uses of Aluminum.

A. As a base for artificial teeth, either swaged or cast, plain teeth answer best for the cast base.

Q. How are teeth attached to a swaged plate of aluminum.

A. By perforating plate with a number of counter-sunk holes for attachment with vulcanite or celluloid.

Q. What is the objection to such a base.

A. Disintegration by action of oral fluids.

Q. What solder is used for articles of ornamentation.

A. Aluminum 6 parts, copper 4 parts, zinc 90 parts, no borax can be used as a flux.

Q. What is the Frismuth solder with vaseline as a flux.

A. Soft solder—pure block tin 90 to 99 parts; bismuth 1 to 10 parts. Hard solder—pure block tin 90 to 98 parts, bismuth 1 to 5, and aluminum 1 to 5; a a mixture of copaiba balsam 3 parts, and venetian turpentine 1 part with a few drops of lemon juice, is also used as a flux, the soldering iron being dipped into it, as such instruments are necessary to make friction at the point of fusion, to insure adhesion.

COPPER.

Q. What is the Symbol of Copper.

A. Cu (Cuprum).

Q. What is its Atomic Weight.

A. 63.4

Q. Source of copper.

A. Commonly from copper pyrites, a combination of sulphide of copper and iron; it is also found as a native metal with silver; the ore is heated in a furnace to convert the iron sulphides into oxide and process repeated with silicious sand, to get rid of the iron; the resulting oxide is reduced by aid of carbonaceous matter and high heat.

Q. How may pure copper be obtained.

A. By decomposing a solution of pure sulphate of copper in a galvanic current.

Q. What are the properties of copper.

A. Great malleability, only exceeded by gold and silver; in tenacity it is next to iron; and for conducting electricity it is equal to silver, and transmits

heat only less than silver and gold; soluble in nitric acid, but only with aid of heat in sulphuric acid; hydrochloric acid has slow action on it; its specific gravity is 8.93.

Q. What is the nature of its alloys.

A. It unites readily with all other metals, it is added to gold and silver to impart hardness as in coins and plate; an alloy of copper and platinum equal parts, has a gold color, and same specific gravity as gold.

Q. What is Aluminum Bronze.

A. Pure copper alloyed with 2. 5 to 10 per cent. of aluminum, quite malleable and of a fine golden color.

Q. What is the effect of copper in an amalgam.

A. Makes it quick-setting.

Q. How may copper be detected in a dental amalgam.

A. The alloy is first acted on by nitric acid, and any silver present is recovered in form of chloride, the copper is then precipitated by caustic potash from remaining solution either as oxide, sulphide, or in metallic state.

IRON.

Q. What is the Symbol of Iron.

A. Fe (Ferrum).

Q. What is the Atomic Weight.

A. 56.

Q. From what ores is iron chiefly obtained.

A. Carbonates and oxides.

Q. How is it obtained.

A. By heating the ores in contact with carbonaceous compounds, by which the metal is liberated.

Q. What are the properties of iron.

A. White color, soft and tough, nearly twice as strong as any other metal, it is one of the lightest, heat makes it ductile, but at ordinary temperatures it is the least yielding and the most rigid; it has a specific gravity of 7. 8; soluble in nitric, dilute sulphuric, and hydrochloric acids; strong sulphuric has little action on it; chlorine and bromine act on it readily; but if kept in contact with a platinum wire, it will remain in strong nitric acid for many weeks without being affected; its strength and value depend greatly on its fibrous texture.

Q. How does steel differ from iron.

A. In becoming very hard and brittle, if, when heated to bright redness, it is suddenly cooled by being plunged in water.

Q. What is Steel.

A. Iron chemically combined with the requisite amount of carbon to endow it with the property of hardness and brittleness when heated to bright redness and suddenly plunged in water.

Q. How is steel made.

A. Imbedding bars of iron in charcoal powder in a furnace for several hours under heat; this makes "blistered steel," cutting such bars into short pieces and heating bundles of them to welding point, and consolidating each bundle into a solid mass under a tilt-hammer, makes "Shear steel," fusing blistered steel in plumbago crucible, and protecting surface from oxidation by melting glass on it, and casting the fluid steel into ingots, makes "cast steel," the best and most homogeneous variety.

Q. What is Bessemer Steel.

A. Steel made by forcing atmospheric air into melted cast iron.

Q. How is hardening of steel done.

A. By subjecting it to extremes of temperature, first coating its surface with soap to prevent scaling and oxidation, and answers best in re-tempering dental instruments; the metal is then heated to full redness and plunged into cold water, oil or mercury, or, with small instruments, placed on a large surface of cold metal.

Q. What is the effect of heating hardened steel to redness and allowing it to cool slowly.

A. It becomes soft, and may be proportionately reduced by heating to short of redness, the proper point of which is indicated by certain colors which appear on the brightened surface of a steel instrument when held over a flame. To obtain a certain temper, it is necessary to plunge the instrument into cold water, or bring it in contact with a cold surface, the moment the desired degree of hardness (temper) is reached, as a certain color shows.

Q. What causes the different colors of discoloration.

A. The formation of a thin film of oxide, which becomes thicker and darker and steel softer, as the temperature rises.

Q. What is the proper temper for dental instruments.

A. Enamel chisels, a light yellow at 430° to 450° F; Excavators, medium yellow at 470°; Pluggers, a brown yellow at 490°; Saws, a brown purple at 520° F., when elasticity is required, blue at 530° to 570°

Q. What should be appearance of fractured surface of fine steel.

A. A silky appearance.

Q. What effect does overheating have on steel.

A. It impairs its quality by depriving it of carbon, and a fractured surface shows a coarse granular condition.

Q. What is case-hardening.

A. Giving to external surface of iron the hardness of steel, by heating it in a substance rich in carbon (such as bone-dust, and cyanide of potassium), and afterwards chilling in water.

Q. How may a steel instrument be distinguished from one of iron.

A. A drop of nitric acid on steel will cause a dark stain by separation of the carbon.

Q. How may instruments be sharpened.

A. By small disks of emery paper; place on mandrel of engine a disk cut from thin metal of same size as emery disk and on this place the emery paper disk; hold the instrument always at same angle against disk, and disk away from cutting edge; as soon as feather-edge appears use a finer grade of emery paper until it disappears; emery paper used is from 0-00-000-0000 according to fineness of edge desired.

Q. How may large tools be sharpened.

A. By using a machine like a lapidary's wheel running a large disk horizontally.

Q. How may burrs be sharpened.

A. Use hard rubber corundum disks (grinding edge of disk thin against emery paper) in the engine, holding burr in the hand; the edge of disk is run through grooves of burr.

PROSTHETIC DENTISTRY.

METAL WORK.

Q. After obtaining impression of mouth what is the next step.

A. To obtain a Model in Plaster of Paris.

Q. What must be determined either when taking impression or before varnishing the model.

A. The mode of forming Vacuum Cavity.

Q. Describe the different methods of forming such a cavity.

A. It can be formed in mouth by attaching a disk of wax covered with absorbent linen to mucous membrane of palate, before the impression plaster is introduced; or it may be cut out on impression; or formed on plaster model with a soft piece of metal; or a considerable area of surface of model may be scraped away.

Q. What parting fluid is used between impression and model.

A. Shellac varnish which stains plaster surface, or sandarach which leaves a glossy surface; many prefer soap solution, made by dissolving an ounce of white soap in a pint of warm water. If any undercuts use either shellac or sandarach varnish and when dry, a slight film of oil.

Q. What will determine size and shape of model.

A. The kind of work; for swaged metal plates, model must be of a size and thickness as to enable die to withstand heavy blows of hammer, and of a shape that will permit of its easy withdrawal from the sand in moulding for the die.

Q. What will give the required shape and thickness to model.

A. Surrounding impression with a flaring rim of tin, or sheet wax two and a half inches wide.

Q. How should the plaster for models be mixed and poured.

A. Mixed quickly and as thin as is consistent with hardness in setting, and poured promptly; in partial and lower cases the impression may be held in hand and the cup tapped lightly against the table or handle of cup rapped on, to ensure plaster settling thoroughly, and to drive out air-bubbles.

Q. How may the expansion and warpage of plaster impressions and models be prevented.

A. Mix three or four ounces of potash alum to gallon of water for mixing plaster; potash alum is sulphide of alumina and potash.

Q. How may the impression be separated from model.

A. If impression is of plastic material it must be thoroughly softened, not melted, and rim turned down first; if of plaster, its easy removal will depend on shape of mouth in full upper or lower cases, and can be done by tapping on cup, or on base of plaster impressions; if form of mouth is not favorable, the plaster impression must be cut into and removed in sections.

Q. How may removal be facilitated in taking impression.

A. By placing small, thin wax cut-offs inside rim of cup, and extending above it so as to cause plaster rim to fracture in sections.

Q. What mineral varnish is used to coat models.

A. Silicate of Soda.

Q. How may a lower cup be prepared to render its removal from plaster impression easy.

A. By coating its surface with wax, which is readily softened.

Q. If metal to form a die is poured into an impression, what kind of cup is necessary.

A. One that does not melt at a low temperature, such as brass, german silver, etc.

Q. How may the plaster teeth on a model be strengthened.

A. By common pins inserted in impressions of teeth in the impression before pouring model.

Q. How should plaster teeth be prepared on a model for sand moulding.

A. Cut off within a sixteenth or at most an eighth of an inch from their base.

Q. How may Plaster Models be hardened.

A. By boiling in a strong solution of alum, or by immersing a warm and dry model in a strong solution of carbonate of soda, which converts surface into carbonate of lime.

Q. How is the die for swaging obtained.

A. By moulding the model in sand, and pouring into the mould melted zinc.

Q. What is the best sand for moulding.

A. A mixture of new and old Brass Moulders sand.

Q. What other moulding materials are employed.

A. Marble-dust, tripoli, and whiting.

Q. What properties should such a material possess.

A. Be fine enough to copy closely and smoothly, yet coarse enough to permit escape of vapor; contain clay enough to give coherence, without packing too compactly.

Q. How should sand be moistened.

A. With enough water only to prevent its crumbling; too much water will cause sand to cling to model, and cause "blowing" of the metal.

Q. How should the sand be manipulated.

A. Packed so as to give an even, firm surface, but not so compactly that vapor cannot escape when molten metal is poured into mould.

Q. What is the effect of the vapor not escaping through the sand.

A. It passes through body of molten metal and renders face of die imperfect.

Q. What may occur if metal chills on contact with surface next to the sand, and remains molten in interior of die.

A. The thin shell forming surface of die will press upward, and make a defective die, without any sign of a flaw on its surface.

Q. What will prevent this, and also the blowing of the metal.

A. By using sand not too rich in clay, nor too fine, nor too damp, and not packed too firmly; also by drying mould; or mixing sand with oil or glycerine.

Q. When may fine sand firmly packed be used.

A. When mould is dried and heated to a temperature of 250°.

Q. When mould is damp, at what temperature should the metal be poured.

A. At the lowest consistent with proper fluidity.

Q. What is the proportion of oil or glycerine to be used in sand.

A. One quart of oil to one peck of sand; one part of glycerine to two of water for mixing sand.

Q. What are the objections to oil-mixed sand.

A. Soiling hands, and disagreeable odor.

Q. What is used to dust over surface of mould before moulding.

A. Soapstone, rotten stone or charcoal powder.

Q. How may undercut models be prepared for sand moulding to prevent dragging.

A. By use of false plaster cores to fill up the undercuts; or by use of Hawe's sectional moulding flask.

Q. How are balse cores prepared.

A. By first varnishing and oiling surface of undercut, and building over it plaster batter giving to outside surfaces of core the required flare to correspond with that of model; then thoroughly drying the core and moulding it with model in the sand; after model is removed from sand, the core is returned to its proper place in mould, and metal of die poured.

Q. How is sand mould for die made.

A. The model is placed on flat surface of moulding bench with face up and heel towards operator; over it the moulding flask is placed; a small quantity of sand is first sifted over face of model, and the flask filled around and full of unsifted sand that it may not pack too tightly; when flask is full, and the sand sufficiently packed, it is leveled off and turned over exposing base of model, and a pointed instrument passed around the base to make a slight bevel in the sand; the sand is then lightly condensed with fingers and all loose particles brushed away; the model is either tapped with the wooden handle of an instrument, or a gimlet is screwed into a small piece of wood inserted in the plaster in centre of base when pouring model, for the purpose of loosening it in the sand preparatory to throwing it out on inverting flask, with a quick movement, or drawing it from sand by means of the gimlet; having a bed of sand on which the model will fall, prevents injury to it, when it is thrown from mould.

Q. What are moulding flasks.

A. Wooden box six or eight inches square with top and bottom boards for die, and a stout iron ring four by two and one-half for the counter die; or the form known as Bailey's moulding flask.

Q. How should the plaster model be placed in the sand.

A. So that the centre of plate to be swaged on it, shall come directly under the metallic cone which is placed on base of die, in order to distribute the force from blows of hammer equally.

Q. How is the plaster model protected in ramming the sand over and around it.

A. By having sand at least an inch deep over its face and around its sides, and compressed by the fingers.

Q. What is the next step in obtaining the die.

A. To pour metal into the sand mould for the die.

Q. What metals are used for dies.

A. Zinc, and Babbit metal; also fusible metal, but the latter principally for partial counter-dies.

Q. What metal is used for counter-dies.

A. Lead; or, as a counter-die for Babbitt metal die, an alloy of lead and tin.

Q. What is the heat required for melting zinc.

A. 770 F. but it should not be overheated.

Q. How should the zinc be melted.

A. In an iron ladle which should be removed from furnace before the zinc has entirely fused, the melting being completed by agitating the fluid metal before pouring it into sand mould.

Q. When zinc is used how many dies and counter-dies are necessary.

A. Two dies with a counter-die to each one, the last being used for finishing.

Q. What is the contraction of a zinc die two inches wide, and two and one-half deep.

A. Between two and three one-hundredths of an inch. Dr Buckingham says one forty-fifth of an inch across and one thirty-sixth of an inch in length, and there is expansion in plaster model of one fourth of this amount. Zinc contracts four times as much as plaster expands.

Q. How is the counter-die obtained.

A. By placing die in centre of flask, and building up sand around it until the swaging surface or face only is left exposed; over this an iron ring from one-half to three fourths larger than exposed face of die, is placed, and the edge slightly imbedded in the sand; the lead or alloy composing the counter-die is then melted and poured at the lowest possible temperature over the face of the die, and the flask filled as far as it is desired to give a certain depth to counter-die.

Q. What is the composition of Haskell's Babbitt metal.

A. Copper one pound, antimony two pounds, tin eight pounds. The copper is first melted, then the antimony, when it is removed from fire and the tin added.

Q. What is the composition of the counter-die for a Babbitt metal die.

A. Lead seven parts, tin one part.

Q. What is claimed for the Babbit metal die.

A. Non-shrinkage.

Q. What advantage has a block-tin counter-die with a zinc die.

A. Sharpness of impression and greater hardness, but should only be used as a finishing counter-die after the use of a lead one.

Q. What properties commend zinc as a die.

A. Hardness, little shrinkage, easy fusibility.

Q. What commend lead as a counter-die.

A. Softness, and low fusing property.

Q. What are the disadvantages of steel, iron, copper, brass, and bronze for dies.

A. Too great shrinkage, and high fusing property.

Q. If great shrinkage in the metal of a die, what is the effect on the swaged plate.

A. It will not be deep enough in arch of palate, nor wide enough between condyles of ridge, and if mouth is unyielding, the plate will bind on each side of alveolus.

Q. If die is too soft and becomes much battered in swaging, what is the effect on plate.

A. It will bear too hard on palate and rock.

Q. What may correct this.

A. The use of a number of dies; but the same will not correct the effect of great shrinkage in metal of die.

Q. What will correct this latter defect.

A. The use of a die of softer non-shrinkage metal (Babbitt metal) following one of the harder shrinkage metals.

Q. Should the swaged plate fit the plaster model or the die.

A. The metal die.

Q. Suppose the model is correct, and although the plate may fit the die yet it will not fit the mouth.

A. Either the process of making die was imperfect; or too few dies have been used; or a metal not suitable; or it is a case which no swaged plate can be made to fit.

Q. Is the moderate shrinkage of a zinc die ever of advantage.

A. Yes, where it counteracts the expansion of the plaster model.

Q. How may a counter-die be made without a sand mould.

A. By dipping the plaster model into the molten metal of a counter-die, within an iron ring, and then carefully pouring into impression of counter-die the metal of die.

Q. How may a die be made without a plaster model.

A. By surrounding impression with an iron ring imbedded in potter's clay, and pouring metal of die into the impression.

Q. Of what should such an impression be composed.

A. Of plaster and marble dust or silex, or fine white sand, or fine coal ashes, first heating it to same temperature as the metal to be poured into it.

Q. Can a zinc counter-die be made on a zinc die.

A. Yes, by pouring the metal for the counter-die at a low temperature, or by coating surface of die with a solution of whiting and alcohol, or lamp-black.

Q. What are such dies and counter-dies used for.

A. The swaging of alloyed elastic metal plates, such as gold alloyed with platinum.

Q. What is the effect of overheating the zinc for a die.

A. Injures the zinc, burns the mould, and causes the sand to adhere to face of die, making a rough surface.

Q. How should zinc be poured into a sand mould.

A. The molten metal should first come in contact with the most prominent parts of mould, which should be filled up steadily, but not too slowly.

Q. Is the depression in the base of all zinc dies any evidence of inaccuracy of face of die.

A. No, but it may be prevented by inserting the heated end of an iron rod in the molten metal as soon as the mould is filled, and thus delay the cooling.

Q. Does zinc deteriorate by repeated melting.

A. Yes; it presents the appearance of hair-like fissures.

Q. How may such zinc be restored.

A. By keeping it in a molten state on fire for ten or fifteen minutes, and covering surface with powdered charcoal.

Q. Should separate ladles be used for melting zinc and lead.

A. Yes, a smaller ladle for zinc to distinguish one from the other.

Q. What is the effect on die of mixing zinc with lead.

A. The lead will sink to bottom of mould and form the face of the die, rendering it too soft.

Q. How may zinc be freed from impurities.

A. By melting in a deep crucible with equal parts of lead, stirred thoroughly and kept melted for one or two hours, covered with powdered charcoal, when lead will settle to bottom carrying with it other impurities; when the mass has cooled to about 650° F. the crucible is inverted and the solid zinc separated from the still fluid lead.

Q. What should be condition of die before pouring metal of counter-die on its face.

A. Cool, dry, and face free of particles of sand.

Q. How much of face of die should counter-die cover.

A. So much as is determined by outline of plate marked on plaster model; more will cause plate to be firmly retained in counter-die after swaging, and be liable to injury on attempt to prize it out.

Q. How is plate loosened from a properly made counter-die.

A. By tapping on base of counter-die.

Q. What is a partial counter-die.

A. One covering but a part of face of die, generally employed for adapting plate to palatine portion of die.

Q. What alloys are used for partial counter-dies.

A. Fusible metals, lead with five to ten per cent. of antimony or one eighth part of tin.

Q. What is a common Fusible metal alloy.

A. Equal parts of Bismuth, Tin and Lead, which melts at 250° F.

Q. How is a partial counter-die made.

A. By building up potter's-clay on surface of die to height equal to depth of die desired, and leaving so much of face of die to be covered by counter-die exposed, as is necessary for size of counter-die.

Q. What is the Spence and Darcet metals composed of.

A. Compounds of sulphur, bismuth, antimony, etc., the first melting at 239°, and the second at 201.2° F.

Q. What is their nature.

A. Hard but very brittle.

Q. How are they used as dies and counter-dies

A. Encased in strong malleable cast-iron box, and the plate swaged between them by screwing or by hydraulic pressure.

Q. How should size of metal (gold, etc)., to be swaged between die and counter-die, be determined.

A. By outline drawn on plaster model; make a pattern of soft paper or thin sheet tin, No. 24, on model, conforming to outline; then flatten it out without stretching, and cut form out of gold plate.

Q. How does gold plate compare in thickness to silver plate.

A. Gold plate being stronger and stiffer, is usually several numbers thinner than silver.

Q. What should be difference between a plate for a shallow mouth and one for a deep mouth.

A. That for shallow mouth should be heavier than one for deep mouth.

Q. How should partial plates be made.

A. Strengthened at all weak points by extra pieces either of plate or half-round wire soldered on.

Q. What is average thickness of full gold plates.

A. Nos. 24, 25, 26, and 27; No. 26 for upper, and 24 for lower plates according to Am. Standard Wire Gauge.

Q. What for Silver plates.

A. For upper full plates No. 24; for lower No. 22.

Q. Describe process of swaging a full upper plate.

A. Place die on bench, with plaster model near, on which is marked outline of plate; anneal the metal by placing it on a support of plumbago or charcoal, and by means of blow-pipe heat it (if gold) to a cherry red (less if silver), and plunge it in cold water to cool it; then place the annealed plate in proper position over face of die; hold it firmly with one hand, and with a wooden or horn mallet, form first the centre of plate over hard palate, until this part is well driven down and adapted to surface of die; repeated annealings of plate may be necessary to accomplish this, but before each annealing the plate should be subjected to the acid bath (sulphuric acid 2 parts, water 1 part) to remove any particles of zinc, and, after swaging, any particles of lead that may adhere to plate; then bend down with mallet the outer edges of plate over the ridge, far enough to meet outline drawn on plaster model; when plate is well adapted to face of die and especially central portion, it is again annealed and carefully placed between die and counter-die; if the outer-edges of plate are carefully and slowly, with repeated annealings, worked by mallet over ridge, there need not be any folds or creases; some prefer placing several thicknesses of soft paper between die and plate; then place them, with the die down, on an anvil, holding the die with the left hand, and strike the die a light blow with a hammer, of three lbs. weight, with handle one foot long; separate the dies, loosen plate from counter-die, and examine to see that it has not moved out of position; if not, anneal, return plate to dies, and strike several moderately heavy blows, repeat annealing and return plate, and strike heavy, fair, sharp evenly distributed blows.

Q. How may the force of the heavy blows be evenly distributed, and the base of die be uninjured.

A. By using a cone of zinc or iron, with a base nearly equal to that of die and several inches long, with a flat apex, on which to strike with hammer.

Q. How should the Gilbert Vacuum Cavity be formed in plate when swaging.

A. By defining the form when central portion of plate is adapted to die, and afterwards, during swaging, using chasers made of hard wood, bone or ivory, carefully thinning and rounding edge of each, and frequently renewing the edge, which is one quarter inch wide; place the edge of the wooden chaser in the imprint of the vacuum cavity, and, holding it at right angles, strike light, rapid blows on the end with a mallet, repeated by passing around the chamber or cavity with the instrument until outline of cavity is sharply defined and the metal not indented or bruised; a chaser made of soft rose-copper answers well as a finisher if carefully used.

Q. How is the Cleveland Vacuum Cavity formed in plate.

A. First make copper model of size and shape of cavity, and as thick as depth of cavity desired; form over this copper model a cap of gold, with a flange, by swaging it between dies, when temporarily attached to die by wax, with copper model under it resting on die at location of vacuum cavity; make edges smooth and slightly bevelled, the edges of cap extending in form of a flange, one sixteenth of an inch wide, beyond copper model; an opening is cut

in plate at location of vacuum cavity, as large as the copper model, and the cap soldered over it by means of the flange which overlaps the opening in plate.

Q. What is claimed for the Cleveland Vacuum Cavity.

A. That the edges can be made to fit roof of mouth accurately; that even in soft mouths the mucous membrane never fills up the cavity, as there is always a space left around the chamber; that no irritation of membrane occurs if all edges are rounded and not left sharp.

Q. Is it ever necessary to cut out V shaped piece of plate and afterwards solder edges, in swaging outer rim over ridge.

A. No, if the plate is slowly and carefully worked over ridge.

Q. How should the swaged plate be finished.

A. Trim edges according to outline; bevel and burnish edges, and place plate in acid bath to remove marks of fire.

Q. How may an accurate adaptation to die be determined.

A. Pressure on front of ridge and on back edge of plate, and around top of ridge with the fingers, should not cause any motion of plate on die.

Q. How may slight inaccuracies of fit be remedied.

A. Locate point in fault, and place several thicknesses of soft paper over point where plate binds and again swage by light solid blows.

Q. How is a double plate for lower jaw constructed.

A. Use No. 28 for gold and 26 for silver; make each plate separately, both swaged to fit die, allowing the lower one to be a little larger around edges so that the two may be soldered together; place both between die and counter-die and swage; then secure them with binding wire and solder; one binding wire clamp in front and one either side near condyles, and twist ends over top of plate; support plate at all points on solder support; then file edges according to outline on plaster model; use little solder, and do not apply flame direct on binding-wire clamps.

Q. How may a lower plate be first adapted to a sharp prominent-ridge.

A. By first grooving it with lower plate bending-pliers.

Q. What is the objection to a swaged rim on lower plates.

A. Cannot reduce plate in depth without cutting through rim.

Q. How construct partial upper plates.

A. Have plate cut a little too large, to allow for slipping, and carefully adapt with mallet, frequently annealing, and in swaging have die and counter-die brought carefully together with plate between; or burrs may be cut in the lead and turned over edge of plate to keep it in position; then swage lightly until it is securely fixed in proper place on die; an excess left around impress of teeth on die can be accurately cut out after plate is well swaged; extensions of plate between natural teeth should be strengthened by additions of plate when teeth are soldered.

Q. How should ends of prolongations of plate in spaces between teeth be finished.

A. Bevelled, or filed to a sharp edge; and for single gum tooth should extend high enough on inner surface of a thin gum to protect it.

Q. How may a lower partial plate be strengethened where the teeth are scattered.

A. By allowing plate to pass over teeth for some distance and made to fit closely to them, it also assists a sharp ridge to bear the pressure of mastication.

Q. How is a partial lower plate made, where the artificial teeth are incisors and canines, or even first bicuspids.

A. Cut teeth from either the model before moulding or from zinc die nearly down to line of plate on lingual surface, inclining on buccal surface so as to form sharp angle; remove edge of front tooth on each side that it may not penetrate the plate; such a form of die will permit the plate to hook over the teeth and hold plate in place during swaging; when soldering on the teeth, a thick piece of plate is added back of the position of natural teeth.

Q. How is a partial lower plate made, where artificial teeth are bicuspids and molars.

A. Cut teeth from either model before moulding, or from zinc die, as in the preceding case but not down to line of plate, so that the plate may extend up over lingual surfaces of natural teeth, and its lower inside edge be carried under the rounded or protruding portion of ridge; this prevents the pressure of mastication on ridge under artificial teeth, and also on gum in front on lingual side, and prevents edge interfering with tongue, and also strengthens such a plate; although an additional thickness of plate may be soldered on inside of natural front teeth, which addition may be swaged separately from plate, and the two soldered together.

Q. How may a rim be swaged on a plate.

A. By forming a flange on plaster model at as sharp an angle as will permit of its being drawn from the sand mould, and of width and outline according to size and location of rim; cut pattern for plate allowing for excess of rim; after swaging, the rim can be turned over more, and when the teeth are soldered to plate, it is burnished to fit closely against the upper edges of gum portions.

Q. How adjust a soldered rim to plate.

A. The plain rim in the form of a strip of metal, may be soldered to plate as soon as it is swaged and trimmed, using binding or annealed wire clamps to secure it at different points during the soldering; the plate for a rim should always extend for a line or two beyond outer edge of rim, so that the latter can be easily soldered; after the teeth are soldered to plate, the edge is cut down to rim and the rim burnished against the upper edges of the gum portion; a better fitting rim is made by first grinding up and arranging the teeth, an impression taken of the surfaces of teeth and plate to which the rim is to be adjusted, and sectional dies and counter-dies made, between which the two sections of the rim are swaged; the process of soldering to plate is the same as for plain rim; after the rim is attached to plate, the teeth are returned to their places, and the case invested for backing and soldering the teeth.

Q. What is the process of fitting the plain rim or a half-round wire.

A. Begin at median line and bend the annealed rim with fingers and plyers (as this rim is continuous) until it is accurately adapted, and bevel each end so as to meet the backing of the last molar on each side in a close joint, and then secure with wire clamps which bind it against plate rim at different points; begin soldering it at median line with small amount of solder, and continue until end of ridge is reached; the free ends bent around tuberosities or condyles are soldered at same time as the teeth.

Q. What is the best alloy to give Clasps elasticity.

A. Gold with two grains of platinum to the pennyweight; or silver with either platinum or iridium.

Q. What forms of alloy are used for clasps.

A. Either in that of plate or half-round wire.

Q. What advantage has half-round wire for clasps.

A. It can be bent in any direction so as to fit irregular and short teeth.

Q. At what points should a clasp be elastic.

A. At the free ends which encircle most of the crown of a tooth; hence a clasp should be soldered to plate so as to leave the greater portion free.

Q. Where should the strongest portion of a clasp be.

A. At the point where it is attached to plate.

Q. How should clasps bind upon the teeth in adjusting them.

A. Not so tightly as to prevent their being readily removed from mouth without change of shape or position; the final fitting being done when the case is finished.

Q. How are clasps fitted to teeth.

A. By clasp-bender plyers, or swaging between dies; formed either on the zinc die, or by some on teeth in mouth.

Q. What is the general form of a clasp before it is soldered to plate.

A. Of such a form as will enable it to fit accurately the palatal side and well down to gum at neck, which necessitates filing its lower edge concave, and except in cases of a tooth standing alone, the clasp should pass between the teeth or pass as far as possible into interspace beween teeth to obtain a firm hold on tooth; this is necessary in the case of a double clasp passing around two teeth.

Q. How should lower teeth, canines, and all where gum has receded from necks, be claspsed.

A. Clasp should fit tooth at greatest diameter of crown.

Q. What are half-clasps or stays.

A. Those made to embrace palatal portion of crown, with the ends passing into the interspaces; the model being slightly scraped to enable them to spring over projecting part of teeth.

Q. How should clasps be made for lower teeth generally.

A. They should embrace tooth near cutting edge or grinding surface, and small hooks attached to them by catching over grinding surface will prevent plate from pressing too hard on gum.

Q. What is done after clasps are fitted to tooth.

A. They are adjusted to plate by filing the latter to accomodate the clasp as it fits tooth in mouth; then the clasps are cemented to plate, all carefully tried in mouth; if cement breaks in removing clasps and plate from mouth, the sharp fracture will be the guide for readjustment; then the case is invested and clasps soldered to plate.

Q. How far should wings of plate extend beyond clasps.

A. Far enough to sustain some pressure, and thus relieve the clasped teeth.

Q. What are the different forms of clasps used to secure dentures in mouth.

A. Plain band, scalloped clasp, standard clasp; the latter standing some distance from plate line, and attached to plate by a standard.

Q. What is average thickness of clasps.

A. Twice that of the plate, as a general rule.

Q. What is used in metal work to obtain the articulation of a full denture.

A. The metal plates after being adapted to mouth, as there is no necessity for temporary or base plates, as in vulcanite work.

Q. In selecting the teeth what is to be determined.

A. Whether gum or plain teeth are to be used; whether single gum or sectional blocks will answer best.

Q. What kind of teeth are used when natural gum is prominent.

A. Plain teeth.

Q. Where a denture is made soon after extraction of natural teeth.

A. Plain teeth.

Q. Where roots remain high up in gum.

A. Teeth with partial gums.

Q. Where natural front teeth of lower jaw project greatly.

A. Plain teeth.

Q. Where teeth have been extracted for some time and absorption is considerable.

A Gum teeth; for full dentures sectional blocks.

Q. Where lip is very long and does not rise sufficient to show the plate.

A. Plain teeth may be used.

Q. What teeth are the most readily arranged, and can be made somewhat irregular to add to natural appearance.

A. Plain teeth

Q. What teeth are generally best for lower dentures.

A. Plain teeth, or gum teeth with long crowns and short gums.

Q. In grinding teeth to fit to a gum which is greatly absorbed or a portion cut away in extracting the tooth.

A. Hide the space by selecting a long tooth and grinding it so that it will project into the space, scraping plaster model at point where tooth is to rest; or a gum tooth with a partial gum may be adapted to such a space if it extends high on ridge.

Q. In arranging plain teeth where roots have been recently extracted.

A. Make them press well into gums, and first grind the base of each tooth to fit model, and afterwards scrape model uniformly, so that the teeth held by wax can be pressed up to plaster surface.

Q. How should roots be treated over which artificial teeth are placed.

A. Cut them away about one sixteenth of an inch below level of gum, the inner edge less than outer, and root surface made level and smooth, and pulp canal filled; make a good joint of base of artificial tooth with surface of root.

Q. What have to be considered in arranging artificial teeth.

A. Length, fullness, inclination, curve, position, spaces between them, etc.

Q. When single teeth are to rest partly on plate and partly on gum.

A. Grind base of teeth to gum first without plate, and then by cutting or filing plate extension, and some little additional grinding adapt tooth.

Q. How fit gum teeth that adjoin natural teeth.

A. Do not let artificial gum extend nearer cutting edge than the gum of the natural teeth.

Q. If space between two natural teeth is too narrow for an artificial tooth.

A. May reduce width of latter, or may place artificial tooth slightly irregular.

Q. If the space is too wide for one or two of same class of teeth.

A. May use an additional tooth and slightly change width of each tooth.

Q. How may the base of a tooth be accurately fitted to prominences and depressions on ridge of plate.

A. By coating ridge during grinding with rouge and oil or other coloring, so that points where tooth rests on ridge may be colored on tooth.

Q. What is a general rule in grinding teeth as regards length.

A. To leave them slightly long so as to allow for the subsequent imbedding of plate in mucous membrane.

Q. Describe order of arrangement for full upper or lower sets.

A. The centrals first, then laterals, cuspids, first bicuspids, in pairs, arranging posterior teeth according to articulation. For full upper and lower sets, some arrange corresponding teeth in each jaw in pairs beginning with inferior centrals; others arrange one set and then the opposite set; lower front teeth are usually placed vertically and are a little longer than the upper; but the length of lips regulate the length of teeth, as the upper should show only the tips when mouth is open and lips not raised, and lower teeth should be made to meet upper.

Q. Is loss of stability due more to length of upper than lower teeth.

A. Of upper.

Q. What should be position of median line of set.

A. Without malformation, the median line of face should divide space between central incisors of both jaws for entire length of their crowns.

Q. What approximal inclination.

A. Centrals lean slightly towards each other, laterals a little more than centrals, cuspids like centrals, bicuspids and molars vertical.

Q. How much should front teeth lap.

A. Cutting edges should just pass each other; more lap will cause lisping, and much will endanger stability from too great leverage.

Q. Upon what teeth should pressure of mastication be.

A. Posterior teeth.

Q. How should grinding surface of posterior teeth curve.

A. According to curve of jaws.

Q. How may this be done.

A. By setting the inferior second bicuspids and first molars somewhat shorter or longer than the first bicuspids and second molars; in any case there should be a tendency of the upper to press backward the lower teeth.

Q. When there is projection of lower jaw (not too great).

A. Set lower front teeth straight, and the upper inclining outwards to meet them.

Q. How should lower bicuspids and molars be placed in relation to ridge.

A. Directly on ridge, and nearly perpendicular; or if the difference between jaws is great, they may incline slightly inwards.

Q. What is the rule in regard to spaces between the teeth.

A. Let there be no space for air to escape in speaking, so that a whistling or hissing sound may be prevented; no spaces for food to lodge between the posterior teeth.

Q. How are teeth held in place during grinding.

A. By cement of wax and rosin; add enough of rosin until it becomes hard and brittle when cold; warm plate to attach cement; each tooth or block may be held in place with fingers, and melted cement dropped on; or a roll of cement may be placed on ridge of plate and thus support teeth pressed into it; for teeth standing alone use gum shellac.

Q. Why are teeth after being arranged, tried in the mouth.

A. To determine if they are properly arranged, and to make any changes necessary.

Q. How may fracture of teeth by their expansion be guarded against.

A. If closely jointed, a strip of thin soft paper should be placed in each joint between the gums, and thus prevent contact.

Q. What is the next step.

A. Investing—securing them in a non-conducting material, so that their position on plate may not be changed during the backing and soldering processes.

Q. What is the investment composed of.

A. Plaster of paris 4 parts; white beach sand 5 parts; pulverized asbestos 1 part; or 3 or 4 parts of asbestos to 1 part of plaster.

Q. What care is necessary in investing a set.

A. That the investment fills under or concave surface of plate, that no vacancies are left about plate, teeth, or clasps; that the teeth are well covered, and securely held in place, and protected from flame of blow-pipe; that edges of plate are covered; that the surfaces to be soldered are well exposed to flame of blow-pipe, and free from overhanging portions of investment.

Q. When investment is hard what is the next step.

A. To trim it, and pick out the cement holding teeth.

Q. How are the teeth prepared for backing up.

A. Some prefer removing them from investment to back them; others prefer to back them without loosening or removing; first cleansing surfaces of plate where solder is to flow, and pins of teeth, and scraping plate surface bright.

Q. What else must be done to the pins.

A. Remove small prominences of porcelain at their base, and straighten them with plyers.

Q. What thickness of backings is necessary.

A. Depends upon length, position and style of teeth; average thickness for gold is No. 22; for silver No. 20.

Q. How wide should the backings be made.

A. Nearly as wide as tooth; a little wider if they are to be united.

Q. How high upon teeth.

A. If front teeth are liable to much strain, the backings should extend to cutting edges; if otherwise, backings should extend half way between upper pin and cutting edge of tooth.

Q. What shape of backings.

A. The top to correspond to cutting edges and grinding surfaces of teeth, and the corners rounded.

Q. What will strengthen backings.

A. When made of an alloy of gold and platinum.

Q. Describe process of Backing by removing teeth from investment.

A. Cut metal into strips of width corresponding to that of teeth; round corners of one end of strip and bevel the sides on outer surface; then place end of strip on base of lead counter-die with paper under it, and with a round-faced hammer make it concave; then remove each tooth from investment successively, and place the concave surface of end of strip against inner surface of tooth over upper tooth pin and by a lateral motion mark the position for upper hole in strip; then punch the first hole and return strip to tooth so that upper pin enters the hole just made; then rotate strip on pin so that a semicircular mark

is made to locate hole for lower pin; then remove strip and punch the lower hole according to the mark; then place strip in position on tooth, and fit it to the surface; then draw a line across strip at base of tooth with a sharp pointed instrument; then remove strip, counter sink holes on outer surface, and cut off backing from strip according to line made on it at base of tooth, allowing it to be a little long so that it may be adapted to surface of plate; then return backing to tooth, and with flat flyers, pinch the pins towards each other, which will leave a space for solder to flow into alongside of each pin; then file pins down to level with surface of backing, and fit base of backing to surface of plate; then return tooth to investment, and, after all are backed, secure them in place with their investment batter, covering all exposed parts of teeth.

Q. How are teeth riveted to backings, instead of pinching pins towards each other.

A. By first counter-sinking holes, then split pins with a sharp knife-blade or graver by two cross cuts, so that heads of pins fill up counter-sinks; if the pins project too far though holes they can be filed shorter before splitting ends.

Q. What advantage in having united backings instead of separate.

A. Shorter and more cleanly.

Q. What is method of forming backings of platinum and gold, and attaching them to teeth before attaching them to plate.

A. Use for first backings thin strips of platinum, and shape as for gold backings, with a flange turned at base conforming to surface of plate, and to determine thickness; the first pin is cut or filed shorter than the second for same purpose; after backing teeth with the thin platinum, each is invested and scraps of the plate are melted on the platinum so as to completely cover it, the gold rising in thickness to height of the pins and also to edge of flange bent up at base; the backings are then filed smooth, and the teeth returned to their places in the original investment, and the base of each backing soldered to plate.

Q. What metal in a solder permits the use of such an alloy almost as fine as the plate.

A. Zinc, as a gold solder composed of 1½ grains of zinc to each pennyweight of same gold as the plate upon which it is to be used, gives a free flowing solder and one almost as fine as the plate.

Q. If solder is made from pure gold what is a good formula.

A. Pure gold 18 grains, silver solder 5 grains, zinc 1½ grains, which gives almost 18 carat solder; the silver solder used in this formula consists of fine silver with one third its weight of brass.

Q. What is the general rule for fineness of gold solder.

A. Use 15 carat solder on an 18 carat plate.

Q. What is the formula for a very free flowing silver solder.

A. Fine silver alloyed with ⅛ its weight of brass, and for every pennyweight of this alloy ½ to 1 grain of zinc.

Q. Describe the preparation for Soldering Process.

A. Protect all places where the solder is not to flow with a solution of whiting in alcohol or water; mix the borax until it is of the consistency of cream; apply it to all places where solder is to flow, with a camel-hair brush; coat the pieces of solder with borax and apply each piece with solder plyers, small square pieces over pins, and oblong pieces at base of each backing, and along

joint if backings are to be united; if small pieces of plate are to be added to fill up any space over which solder is to flow, as solder will not bridge spaces, they are to be applied like pieces of solder; gold foil may also be used to fill spaces; too much solder is objectionable, and if too little is first applied more can be added during soldering.

Q. Describe process of Soldering.

A. Heat the case slowly and uniformly in a furnace, oven, or gas stove, until plate is of a dull red color, or to nearly the fusing point of solder; if the hand furnace is used for heating up, the top can then be removed and the lower part used as a support, if not, the case is placed on a solder-support; the large flame of the blowpipe (mouth or automatic) is then so directed that it covers the entire investment, but does not bear directly on the solder; and when all parts of plate are heated more than the solder, the flame is reduced to a pointed blue one, and directed on the solder.

Q. What is effect of directing the soldering flame on solder before the plate is heated to fusing point of solder.

A. The solder will roll up into a ball.

Q. Where has solder a tendency to flow.

A. Towards the hottest point.

Q. How may the flow of solder be directed.

A. By the heat (or flame of blowpipe); or by the heated point of a long excavator.

Q. What does good soldering consist in.

A. Fusing and flowing solder at proper place, uniting all pieces, and leaving a smooth surface.

Q. How is the case treated after soldering.

A. Placed under cover to cool slowly; some prefer wrapping case in folds of newspaper; then taken from investment by breaking the latter away, and put in a solution of equal parts of sulphuric acid and water, to dissolve fused borax and cleanse the gold; heating acid solution will hasten this process; common alum solution may be used instead of the acid; then wash in a solution of soda and water to remove acid, and examine teeth.

Q. Describe the Finishing Process.

A. Shape, make smooth and uniform the surface covered by the solder, removing the line where the solder joins the plate, by means of scrapers, files, Scotch-stone, brush or felt wheels and cones, or corks charged with tripoli or rotten-stone, and polish with whiting, prepared chalk, or rouge.

Q. How adjust a new tooth to an old set.

A. Select a duplicate of the lost tooth with long pins, and after grinding so that pins rest against old backing, cover the inside surface of backing with a thin coating of wax, press the tooth against wax and punch, or better, drill new holes in backing, and proceed as for backing and soldering a new set.

Q. How may a new tooth be riveted to an old backing.

A. Determine position of holes and drill them as just described, but countersink them deeply, so as to give a good head to each pin; then place surface of tooth on base of a lead counter-die with thin paper between the two, and with a small riveting hammer strike light blows around outer edge of each pin so as to flatten and thicken them, and continue this, first on one pin and then on the other, so that both may be thickened together; when counter-sinks are thus filled by the spreading of ends of pins, direct blows may be given on tops of

pins at the end of the riveting to make the surface of each pin uniform; the tooth should be firmly held on lead during process.

Q. What grade of solder should be used in repairing a set, the carat of plate unknown.

A. A low grade, 14 or 15 carat solder.

Q. How is a cracked gold plate repaired.

A. By allowing crack to remain open and soldering a piece of plate over it.

CONTINUOUS GUM WORK.

Q. What is Continuous gum work.

A. Teeth arranged on a base plate of platinum, or platinum and iridium, and a procelain continuous gum built around them, extending over lingual surface of plate, and afterwards fused in a furnace.

Q. What kind of teeth are used.

A. Teeth with long necks and long pins.

Q. What are the teeth soldered with.

A. Pure gold, or gold and platinum alloy.

Q. What is average of platinum plate.

A. From No. 28 to 30.

Q. Are backings to teeth necessary.

A. No, a rim of platinum is soldered to ridge of plate on lingual surface, and the pins of teeth are bent down over rim, and soldered to it.

Q. How is the soldering done.

A. By introducing case into the heated muffle of furnace.

Q. Is the case invested in plaster and asbestos.

A. Yes, to secure position of teeth according to the antagonism; after the teeth are soldered the portion of investment about them is removed, but that under the plate is left as a support or base.

Q. How is the set prepared for the body and enamel.

A. By first cleansing teeth of all particles of investment and immersing the set taken from the support, in sulphuric acid, when it is washed.

Q. What is the Body.

A. A colorless mineral compound composed of spar, quartz, German clay Bohemian glass and French china.

Q. How is the Body applied.

A. In a plastic state by a small spatula and camels-hair brush, and carved in form of gum, and rugae of mouth.

Q. Is the Body baked before the enamel.

A. Yes, by putting set on a slide and slowly introducing it into the muffle of furnace, and semi-vitrifying the body.

Q. What is then done.

A. It is slowly and carefully withdrawn and cooled in another muffle, to prevent fracture of teeth.

Q. What is the next process.

A. More body is added to fill up cracks made by the first baking, and it is baked a second time, and cooled as before.

Q. What is then done.

A. The surface of body is covered with plastic flesh-colored enamel, applied with a camels-hair brush, and set is again placed in furnace and subjected to a higher heat than before, by which the enamel flows evenly and smoothly, leaving a glossy surface; the piece in then cooled as before.

Q. What is the best fuel for continuous gum furnace.

A. Coke.

Q. What other furnace is sometimes used.

A. Gas furnace.

Q. How may a new tooth be added to an old set.

A. After being adapted to space made by removing part of old tooth, by grinding it out, body is packed around the new tooth, which is backed, then the body is enameled and again returned to furnace to fuse the enamel.

Q. How may a difference of color between old and new enamels be prevented.

A. By covering old gum with fresh gum-enamel.

Q. What is the enamel composed of.

A. Gum frit, flux, granulated body and cryolite.

Q. What is granulated body.

A. Silex, feld spar, caustic potash, and titanium.

Q. What is flux.

A. Silex, feld spar, borax glass, cryolite, caustic potash and titanium.

ARTIFICIAL DENTURES OF FUSIBLE ALLOYS.

Q. What does this method consist in.

A. Making plates by pouring a fusible metal made plastic by heat.

Q. What are the different fusible metals now used.

A. Wood's, Weston's, Watt's, Reese's, Essig's, Carroll's aluminium.

Q. Are the manipulations of all of them practically the same.

A. Yes.

Q. What metals form these fusible alloys.

A. Pure tin, bismuth, cadmium, lead, gold, silver, aluminium.

Q. What is the model for such work composed of.

A. Plaster of paris ⅞, fine pumice stone ⅛.

Q. How is the vacuum chamber formed on model.

A. By cutting out form in impression; or building on model with batter of plaster and pumice.

Q. How may the latter method be neatly done.

A. By covering surface of model with base plate wax, and then placing on this in proper position a form of chamber cut out of paper, by this paper form the cavity is cut in the wax down to the model, and plaster surface roughened and moistened; the batter is then poured into the cavity in the wax; and after it hardens and wax is removed, the edges and surface are trimmed and smoothed.

Q. What is used as a base-plate on which to mount the teeth, etc.

A. Thick tin foil burnished to model and covered by wax base plate.

Q. How are the teeth mounted and the trial plate made.

A. Same manner as for vulcanite.

Q. What kind of teeth are used.

A. All kinds, but usually vulcanite or celluloid teeth.

Q. What flask is generally used.

A. Watt's moulding flask.

Q. How is such a case invested or flasked.

A. Same as vulcanite, except that investment consists of plaster ¾, fine pumice ¼, and two small gullies are cut from heels of plate to each of the funnel-shaped openings of flask; the two halves of flask are held together by a clamp with handle.

Q. When the two halves of flask are put together after removing the base-plate and wax, how is the mould prepared for the metal.

A. It is slowly dried in an oven or on gas stove, until no moisture appears on a mirror held over openings in flask.

Q. Is too high a temperature of mould objectionable.

A. Yes, as metal will not chill in mould quick enough, and may escape at smallest crack between sections of flask.

Q. When should the pouring of the metal cease.

A. As soon as it rises in the little ventholes.

Q. What does the finishing consist in.

A. Filing, scraping, sand papering, and polishing with whiting.

Q. What have fusible alloys been principally used for.

A. For lower dentures where weight is necessary to retain set.

Q. What does the Aluminium Cast Base Process consist in.

A. Forcing the molten alloyed aluminium into the mould by a rubber bulb.

Q. What is Reese's Gold Alloy Cast Base composed of.

A. Gold 1 part, silver 2 parts, tin 20 parts.

Q. What is Kingsley's Base composed of.

A. Pure tin 16 parts, bismuth 1 part.

Q. What is the Electro-Metallic Process.

A. Depositing, by a battery, gold and silver directly upon surface of plaster model and thus forming a plate, or set of teeth.

Q. How is the gold first deposited.

A. By coating surface of model with plumbago; a definite thickness being deposited, and upon the gold a deposit of silver is made which in like manner is covered by another deposit of gold.

Q. What is the object of the intermediate deposit of silver.

A. To give strength, as all deposited metals are weak, but silver is stronger than gold.

Q. May the gold be deposited upon a thin, swaged, silver plate.

A. Yes, but better adaptation is secured by the first method.

Q. What objection is there to soldering such a plate.

A. The annealing will render plate too pliable.

Q. How are the teeth attached.

A. By depositing the gold and silver on and around the pins.

ARTIFICIAL CROWNS ON NATURAL ROOTS.

Q. What is the object of "pivoting" roots of teeth.

A. The preservation of the root, and to obviate necessity of wearing a plate.

Q. What kind of pivots or dowels are used.

A. Wooden and metallic; the use of the latter has almost entirely superceded that of the former.

Q. What is method of inserting crown on wooden pivot.

A. Exposed end of root is made concave from side to side by files and corundum wheels, and shortened below level of margin of gum; pulp-canal enlarged for pivot, which is made of seasoned hickory, or locust wood, condensed by forcing through draw-plate holes; pulp-canal beyond pivot is closed by filling; a temporary pivot of soft wood is first used to determine position of crown; the permanent pivot is made to fit tightly enlarged portion of canal, and before inserting in root is tightly fitted in hole of crown; the canal is then dried and crown with pivot of proper length and diameter, is forced into place; if root canal opening and hole in crown do not correspond in direction, a larger pivot is used for canal portion, and cut away at desired angle; when pivot becomes wet, it expands and holds very firmly; in the root more tightly than in crown; a close joint should be made between crown and root.

Q. How are metallic pivots made and inserted when plain plate teeth are used.

A. The teeth are backed with gold or thin platinum over which gold is flowed; a disk of metal is made to cover and fit accurately the concave (or flat) exposed surface of root, and a pivot of metal (gold, or gold and iridium, or platinum) is soldered to the under surface of disk at a point where its direction will correspond to hole in root; pivot is generally made square tapering to a point, and is attached to root by gutta-percha or oxyphosphate or oxychloride of zinc.

Q. How are crowns attached to pivots such as the Logan, Mack, Gates, Foster, How, Bonwill, Meriam, Weston, Leech, and others.

A. By first inserting pivot securely in enlarged root-canal, and then securing crown to pivot by bending over it the long pins of crown and filling over them gold, or, more usually, amalgam. In Logan crown the pivot is secured in crown when it is baked, and adjusted to root and secured by zinc filling material or gutta-percha; sometimes a gold tube is fitted into enlarged root-canal, and pivot made to fit tube tightly; in other cases the pivot is made of tube-form and split for some distance from its free end by a saw or fine separating file, and after it is attached to crown and inserted into root, the tube pivot is filled through an opening in palatal surface of crown, with gold or tin-foil which expands the end of pivot and holds crown securely to root.

Q. What does a Collar-Crown consist of.

A. A plate or disk of metal to cover exposed end of root with a thin piece of gold plate soldered to it, so as to form a rim or collar for better protection of root, and wide enough to extend a little beneath free edge of gum, thus forming a cap to the root; the metallic pivot is attached to under surface of this cap.

Q. How should root be prepared for collar-crowns.

A. Cut root down nearly to surface of gum, but not near enough to make it bleed, or lacerate gingival margin; ream out root-canal with a Talbott reamer, more towards platatine than towards labial side; make a square or oblong pivot or post tapering to a point; then cut grooves in sides of root-canal, then cut away root a little below level of gum all around, but a little deeper on labial side, so as to have point under margin of gum, and leave root on palatal side high enough for collar; then with a cone-shaped drill cut away around end of root the projecting portion, so that the collar will fit the root closely at its lower edge; the collar is fitted in making to the prepared surface of root, and is ⅛

inch wide and very thin (of platinum or pure gold); then a disk or cap for collar is made of same material as collar, and the pivot passes through a hole in top of cap that it may be soldered to it; after soldering the post to cap, try in mouth and burnish lower edge of cap to root; the porcelain crown or facing is then backed, and soldered to cap and post; like an inlay, a porcelain facing must be selected a shade lighter than adjoining teeth, as it becomes darker after backing; the post is barbed on edges and secured in root with zinc cement or gutta-percha. Some cut away labial surface of root considerably, that base of facing may go under gum.

Q. What are "all Porcelain Crowns," such as the Bonwill, &c.

A. Crowns with concave or counter-sunk base, a triangular opening from base to pivot at or near cutting edge of incisors, a peripheral margin or border to rest flat on root, with concavity of base on palatal side at a more acute angle than on proximate; in incisor crowns an anchorage, by an depression undercut between labial and palatal surfaces opening on palatal; bicuspids and molars have retaining-pits nearer grinding surface.

Q. How are these crowns attached to the pivots or posts secured in roots.

A. By almagam or gutta-percha; amalgam for outer surface if gutta-percha is used within.

GOLD CAP-CROWNS.

Q. What is the object of all gold cap-crowns.

A. The capping and hermetically inclosing with gold the crown, or any portion of it, and neck of tooth or root, for permanently preserving them.

Q. What do they consist in.

A. Seamless caps of fine gold made by a die or stamping press; or in sections consisting of a band and top soldered together; or a band around crown made wider than length of crown, so that slots may be cut in projecting portion; and then bending the separated parts inward over grinding surface of crown, and finally flowing solder over them and thus forming the grinding surface of cap.

Q. How should a Cap-Crown be adapted.

A. Palatal portion should go well up under free edge of gum, and cut out at edge of root, if necessary, at cervico-labial edge; the edges that pass under gum should be burnished to sides of root.

Q. How are such crowns attached.

A. To crown, if sufficient remains, by zinc cement; otherwise to root by an iridio-platinum pin, fitted tightly to root-canal and first soldered to crown.

Q. How should a natural crown be prepared for a cap-crown of gold.

A. By carefully removing all decay, treating and filling (if necessary) root-canals, building up with gutta-percha or zinc cement contour of crown (to restore lost part), and taking an impression in moldine and securing a metal die over which to fit gold crown.

Q. How are gold crowns with porcelain fronts or facings made by Dr. G. Evans' process.

A. A model of restored tooth-crown is secured; two casts, one of coronal form of tooth, and other of only palatal and proximal portions are made using moldine in tubes with fusible metal. A piece of gold or platinum crown plate, No. 34 U. S. Standard gauge, about length and circumference of tooth, is then struck up on palato-approximal cast; it is then transferred to coronal cast, which it previously trimmed about the thickness of the gold plate upon approx-

imal surfaces, and worked down to exact form of tooth on anterior portion; the metal form of tooth is cut even at incisive edge, the seam down front bevelled and lapped, marked, and slightly opened, and removed from die; by the mark, the gold is pressed back to form assumed on die, and fitted to natural crown, previously trimmed and shaped, and joint on labial side soldered; into open incisive edge, a narrow strip of gold one-sixteenth of inch and thick enough to fill space, is fitted and soldered; the crown is then filled with plaster, labial portion cut away so as to leave upper part to form band and lower part the incisive edge; a porcelain tooth of proper shade and form is ground and thinned down, the pins ground away in process, but left thickest at incisive edge; this porcelain facing is then removed, and platinum foil adapted to its back, and turned just barely over its edges, the upper and lower of which are slightly tapered off; the porcelain front is then adjusted on crown, and cemented on one side with wax, and crown invested in plaster and marble dust, so that seam along edge of platinum and gold is exposed on cemented side and one end; the seam is then soldered with 20 carat solder; solder is not to be flowed on porcelain or too much borax used; then the crown is again invested and remainder of seam soldered, the excess of porcelain on inside of crown is ground away; when fitted crown is attached with zinc cement.

Q. How are roots of teeth prepared for gold collar crowns.

A. Where pulp is alive, labial surface and cutting-edge should be ground down as much as can be done without exposing pulp to irritation; palatal portion at an angle from cervical border to cutting-edge, enough to level its prominence of contour and form a slight space between it and antagonizing teeth. Teeth pulpless, are ground to margin of gum at labial portion and slightly above margin on posterior half. Leave as much as possible of natural molar and bicuspid crowns; as anchorage, amalgam can be built securely in enlarged pulp-chambers, and built up to restore form of crown for attachment of gold or porcelain-faced crowns; or pins or screws can be inserted in root-canal, and cemented with zinc cement and amalgam.

Q. How may a front tooth greatly abraded be crowned.

A. If pulp is alive, remove portion of labial surface, and form artificial crown similar to a gold collar crown without post.

Q. How is the Parr Crown adjusted.

A. The root is prepared and a band and cap made same as a gold collar crown; a hole is made in cap, and a post fitted to canal, a disk of gold as large as cap on root is adjusted on post above cap, by making hole in gold in which post fits tightly; the gold plate or disk is adapted to cap on root and burnished close around post forming an outside cap; post and outer cap are then removed, soldered together and fitted to inner cap, and edge of outer cap trimmed even with it; porcelain tooth to form crown is fitted and attached to outer cap, which is cemented in position.

BRIDGE-WORK.

Q. What is Bridge-work.

A. The replacement of a portion of the teeth by bridging the vacant spaces with artificial teeth supported by anchorage to adjoining natural teeth.

Q. What are the rules that govern the number and position of anchorage teeth.

A. (Evans, Dr. G.) One central root will support two centrals; two centrals

will support four incisors; the cuspid roots will support the six anterior teeth; one molar or bicuspid on one side, and a bicuspid or molar on the other with one or two roots between, will support a bridge between them; one right and one left molar, with the two cuspids, will support bridge of entire arch; a bridge on one side of mouth can be supported by two or three teeth or roots on that side.

Q. What preparation of roots to support bridges.

A. The same as for ordinary cap and other crowns, but the cutting and trimming of sides of roots and teeth and enlarging of root canals, should be in parallel lines for easy adjustment.

Q. With a case where the roots of the two upper cuspids and crowns of right upper second and left upper first and second molars remain in mouth, what is first done (Evans, Dr. G.)

A. Cap right molar with gold crown; cap two cuspid roots with collar crowns and posts; adjust artificial teeth (porcelain fronts) in mouth on wax without the gold crowns; then return to model, and build up on labial surfaces of teeth enough of investment of calcined marble-dust and plaster to hold them in position; remove wax exposing inner surfaces, then remove porcelain teeth and fronts (except fronts for roots capped), and base ground from a line on palatal surface below pins, straight to labio-cervical edge, to form self cleansing spaces; back incisors with thin platinum or pure gold, and allow backings to extend just over cutting edge, as a protection, and to edge of self-cleansing space; back the bicuspid and molar fronts in same manner after grinding off their tips; then strike up a cap of pure gold, or gold and platinum, to represent grinding surfaces, and fill concave portion by melting in scraps of gold; then grind surface smooth and fit to tip of porcelain front to form occluding surface according to articulation with lower teeth, and fill space with wax; this metal surface protects the porcelain; then cut and fit to sides triangular pieces of gold plate or platinum foil; let them extend slightly over sides, and invest tooth, leaving back open like a pocket, the end of bridge on left side is to be anchored in a slot cut in the molar; this bar is made of iridio-platinum wire filed square, adjusted to tooth and cap with wax and tried in mouth; invest all the incisors, and the porcelain fronts of cuspid crowns, at same time; and in soldering melt twenty carat gold plate into the pockets, and flow gold over backings of incisors and cuspid fronts sufficient to shape them, then trim and finish each tooth; then attach teeth on model with wax and apply investment of marble dust two parts, plaster one part, until all the bridge is covered except space along backings and crowns where they are to be united in soldering; place in space between backings, pieces of gold or platinum plate and solder over these; then finish with wheels and points.

Q. How is such a bridge adjusted in mouth.

A. By first trying in and arranging articulation, then permanently attach bridge by first barbing the posts, and cement the crowns on with oxyphosphate of zinc, and anchor end of bar in slot of right first molar by either a gold or amalgam filling.

Q. How are small pieces of Bridge-work constructed, (Dr. G. Evans).

A. First make crowns for anchorage teeth or roots, and temporarily place in position; grind and back the teeth, adjust them, cement with resin and wax in proper position between the crowns; then remove crowns and teeth together in an impression cup filled with investment; the inside surface of cup should

be serrated and coated with wax; then warm impression cup and remove its contents; cover exposed parts of crowns and teeth with more investment, and expose parts to be filled in and soldered; solder and finish.

Q. What are removable Plate Bridges.

A. Those with a plate to span space and support teeth between abutments, the posts and collars moving evenly on and off the supporting roots and crowns.

Q. What is the mandrel system, (Dr. Starr).

A. A method of determining the configuration of the necks of teeth, and shaping and adapting the collar crowns accordingly by means of seven mandrels, six of which are double ends, their shape modeled upon the general forms of necks of teeth.

Q. What is Dr. Parmly Brown's Porcelain Bridge-work.

A. Formed entirely of porcelain with an iridio-platinum bar running through denture as a sustaining piece, thus showing a perfect continuity of porcelain surface.

Q. How are the ends of bar anchored.

A. Either in a crown as a post, or in a filling in approximal surface of adjoining tooth; ordinary plate teeth used, the pins rivited to or bent over bar, and a porcelain body filled around the rivets and bar of each tooth and baked same as continuous gum.

Q. What are the metals used for collars, caps or crowns, and for backings and posts in bridge-work.

A. 22, 23 and 24 carat gold plate for collars, for crowns, and gold seamless crowns; pure platinum for same, and iridio-platinum wire for posts.

Q. What grade of solders.

A. 22 carat for crown-work, and 20 carat for crown-and-bridge-work; also 18 carat; and 14 carat for strengthening seamless crowns.

Q. What is Dr. G. Evans' formula for solder 20 carats fine.

A. Zinc 1½ grs., pure gold 20 grs., silver solder 3 grs., the zinc being burnt out in soldering process.

Q. What is Dr. Dorance's formula for 20 carat solder.

A. An alloy consisting of 1 part pure silver, 2 parts pure zinc, 3 parts pure copper; four grains of this alloy melted with 20 grains of pure gold will give a 20 carat fine solder.

Q. What is Dr. Low's formula for a 19 carat bridge-work solder.

A. 1 dwt. of pure gold; 2 grs. copper; 4 grs. silver.

PORCELAIN TEETH.

Q. What are the chief ingredients of porcelain teeth.

A. Feldspar, silica or flint, and kaolin.

Q. What is kaolin.

A. Decomposed feldspar, consisting of nearly equal proportions of alumina and silica.

Q. What is feldspar.

A. An essential part of most of the primitive rocks; a double silicate of aluminum and potassium.

Q. What is silica or flint or quartz.

A. Exists more or less pure in white sand; best is from rock quartz or rock crystal; silicic oxide, a compound of silicon and oxygen.

Q. Give a formula for bodies of moulded block teeth.

A. Kaolin 1 oz. silica 3 oz. feldspar 18 grains, titanium oxide 65 grains, starch 10 grains to each ounce; medium color.

Q. Give a formula for bodies for carved blocks.

A. Kaolin 1 oz. silica 3½ oz. feldspar 14 oz. titanium oxide 40 grains, no starch for carved blocks; give medium color.

Q. Give formula for a blue frit or color for enamel.

A. Platinum (dissolved in aqua regia) 1 pennyweight, feldspar 1 oz. plate glass, 20 grains.

Q. Give a formula for gum frit.

A. Purple of Cassius 16 grains, feldspar 700 grains, flux 175 grains.

Q. Give a formula for gum enamel.

A. Frit 1 pennyweight, feldspar 3 pennyweights.

Q. What are used to color and tint artificial teeth.

A. Titanium, platinum sponge, oxide of cobalt, oxide of gold (purple of Cassius), oxide of magnesia, oxide of uranium, oxide of silver.

Q. Give relation of shape and color of teeth belonging to each basal temperament.

A. Bilious:—golden yellow color; flat face large and angular. Sanguine:—Soft yellow; round face and bold. Nervous:—Transparent blue or gray; graceful, semi-round face. Lymphatic:—Opaque white; spheroidal and rather broad face.

ATMOSPHERIC PRESSURE.

Q. What is the pressure of atmosphere at level of sea.

A. 13 to 15 lbs. to the square inch.

Q. Why is a pressure of ten tons weight on external surface of body not apparent.

A. Because all portions of body feel it alike on every side.

Q. What does atmospheric pressure acting on all sides, but unequally distributed, become.

A. A physical force which may be made to exert a prodigious power.

Q. If two surfaces are brought into such contact as to entirely exclude air, what degree of force holds them together.

A. A force proportioned to extent of surface of contact.

Q. If touching at their edges, so that an air-tight space is included from which air may be exhausted, upon what will the adhesion depend.

A. 1st. Upon the completeness of exhaustion. 2nd. Upon the superficial area bounded by lines of contact.

Q. When are these two conditions of adhesion aimed at.

A. In plates of artificial dentures with and without vacuum cavities.

Q. How accomplished in plates without vacuum cavities.

A. By perfect adaptation or contact.

Q. How in plates with such cavities.

A. By contact combined with the power of a vacuum.

Q. Does the adherence between surfaces by atmospheric pressure though it may exist in combination with adhesion, assume the nature of an attraction.

A. Not in the least.

Q. What are two leaves of cohesive gold, or two surfaces of a smoothly cut lead bullet, or two highly polished surfaces of ground glass, examples of.

A. Cohesive attraction existing between similar particles; in the case of the first two it is called welding.

Q. What is water rising in capillary tubes, and water suspended in drops from a polished surface, or between two surfaces of smooth glass, examples of.

A. Adhesive attraction existing between dissimilar forms of matter

Q. What holds a properly adapted plate to mucous surface.

A. Partly adhesion, partly attraction, but chiefly atmospheric pressure.

Q. How many pounds should surface of an upper plate 3 to 5 inches square, if air could be perfectly excluded, sustain from its centre.

A. A weight of 45 to 75 lbs, a force sufficient to tear off the mucous membrane.

Q. What is the nearest approach in dental practice to such a degree of adhesion.

A. A plaster impression of mouth

Q. Why is it that an impression when returned to mouth after once being withdrawn, will no longer adhere with same force.

A. Because it is impossible to avoid including air between the surfaces; and pressure on plate acts around edges equally as at center, and can only partially displace the air; the air bubbles are flattened by pressure and spread over surface, not excluded.

Q. Why cannot a plate be made to act as a boy's leather disk in raising a weight.

A. Because with the plate air is unavoidably enclosed, and pressure on plate acts around edges equally as at centre, and can only partially displace the air, and the air-bubbles are flattened by pressure and spread over surface, not excluded; with leather-disk the air is entirely pressed out and a more perfect vacuum formed.

Q. What are the three methods of overcoming the difficulty and disposing of the air.

A. By suction, to draw out some of the air.

By pressure, to force much of it out.

By means of a vacuum cavity at or near the centre of plate to collect it into a comparatively small space, and thus relieve the edges of cavity.

DEFORMITIES OF PALATE.

Q. What are the three distinct causes of deformities of hard palate.

A. Congenital deficiency as in cleft palate; perforation and lesion of hard and soft palates from mechanical injuries, such as shot wounds.

Q. What is the nature of syphilitic perforations of hard palate.

A. Generally in median line, often oval in shape, less frequently round, aperture bevelled off at expense of palatal surface, giving a funnel-shape; usually located in anterior third of palate.

Q. When ulceration has caused a cleft, what are usually present.

A. Strong cicatrices drawing cleft widely open.

Q. To obtain an impression for artificial palate what preparatory treatment is necessary.

A. To paint parts with solution of bromide of ammonium, or tannin 1 drachm, and glycerine four ounces, or a 4 per cent. solution of muriate of cocaine.

Q. What material answers best for such an impression.

A. Plaster of Paris.

Q. What form of impression cap.

A. One especially prepared; should fit closely in front to teeth, and at back leave a space about ⅛ inch from its surface to corresponding surface of soft palate.

Q. What must be avoided.

A. An excess of plaster, and its falling on base of tongue or into throat, and thus cause retching.

Q. How should the plaster models be used.

A. They should be duplicated in type metal.

Q. How is impression of deep cases generally obtained.

A. In two parts, one part at a time, and afterwards joined together.

Q. Can artificial teeth be added to such an appliance.

A. Yes, if necessary.

Q. How are artificial palates divided.

A. Into Obturators and Artificial velum.

Q. What is an Obturator.

A. A hard, non-elastic appliance to fit into an opening or perforation in hard palate and close it completely.

Q. What is an Artificial Velum.

A. An elastic movable valve applied to congenital fissures of soft palate, and under the control of the surrounding and adjacent muscles, closing and opening the passages at will.

Q. How many of the sounds of articulate language depend upon the integrity of soft palate for perfect enunciation.

A. More than three-fourths; hence the necessity for the same movement in an artificial palate.

Q. How do the surrounding muscles control such an appliance.

A. Artificial velum extends across the opening and rests on the muscles of either side. The levator muscles throw it up with all sounds requiring closure of nasal passage; the thickness of the velum brings its posterior surface in close contact with the superior constricter muscle, affording in pronunciation of guttural sounds, a firmer resistance to pressure of tongue than is possible with a thin obturator; a hinge connects the movable with stationary part; such movements as above are made so free and easy that there is no moving of the plate as would occur if the appliance was rigid. The weight of the velum itself renders its descent certain if a nasal sound follows a guttural.

Q. What artificial palates have given satisfaction

A. Stearn's and Kingsley's.

Q. What is the nature of the rubber used for velum.

A. A soft elastic vulcanite; hardened sufficiently by heating up to 230° F. and gradually increasing every 2 hours to 250° and 260° F. for six hours.

END OF PART III.